GROUNDWATER MANAGEMENT AREA 9

EXPLANATORY REPORT FOR

DESIRED FUTURE CONDITIONS

MAJOR AND MINOR AQUIFERS

Prepared by:

Groundwater Management Area 9

Joint Planning Committee

With technical assistance by:

Blanton & Associates, Inc.

ENVIRONMENTAL CONSULTING • PLANNING • PROJECT MANAGEMENT

and

LBG GUYTON

April 18, 2016

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Meaning
ac-ft	acre-feet/acre-foot
ac-ft/year	acre-foot (feet) per year
BCRAGD	Bandera County River Authority and Groundwater District
BFZ	Balcones Fault Zone
bgl	below ground level
Boerne	City of Boerne
BPGCD	Blanco-Pedernales Groundwater Conservation District
BSEACD	Barton Springs/Edwards Aquifer Conservation District
cfs	cubic feet per second/cubic foot per second
CCGCD	Cow Creek Groundwater Conservation District
COK	City of Kerrville
Committee	Groundwater Management Area 9 Joint Planning Committee
CTGCD	Comal Trinity Groundwater Conservation District
DFC(s)	Desired Future Condition(s)
DOR	drought of record
EA	Texas Water Development Board Executive Administrator
EAA	Edwards Aquifer Authority
Edwards	Edwards Aquifer
Edwards Group	Edwards Group of Edwards-Trinity (Plateau) Aquifer
Ellenburger	Ellenburger- San Saba Aquifer
ER	Explanatory Report
ft	feet/foot
GAM	Groundwater Availability Model
GMP	Groundwater Management Plan
gpd	gallons per day
gpd/ft	gallons per day per foot (or feet)
gpm	gallons per minute
GMA(s)	Groundwater Management Area(s)
GMA-9	Groundwater Management Area 9 Joint Planning Committee
GCD(s)	Groundwater Conservation District(s)
H.B. No.	House Bill Number
HCT GAM	Hill Country Trinity GAM
HGCD	Headwaters Groundwater Conservation District
Hickory	Hickory Aquifer
HTGCD	Hays Trinity Groundwater Conservation District
MAG	Modeled Available Groundwater
Marble Falls	Marble Falls Aquifer
MCGCD	Medina County Groundwater Conservation District
mg/l	milligrams per liter
PGMA	Priority Groundwater Management Area
Region J	Plateau Regional Water Planning Group
Region K	Lower Colorado Regional Water Planning Group
Region L	South Central Texas Regional Water Planning Group
RWP(s)	Regional Water Plan(s)
RWPA(s)	Regional Water Planning Area(s)
RWPG(s)	Regional Water Planning Group(s)
S.B. No.	Senate Bill Number
SOAH	State Office of Administrative Hearings
SWP	State Water Plan
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TDS	total dissolved solids
TERS	Total Estimated Recoverable Storage

Acronyms and Abbreviations (continued)

Acronym/Abbreviation	Meaning
TGRGCD	Trinity Glen Rose Groundwater Conservation District
Trinity	Trinity Aquifer
TWC	Texas Water Code
TWDB	Texas Water Development Board
UWCD	Underground Water Conservation District

EXECUTIVE SUMMARY

Groundwater Management Area 9 Joint Planning Committee Explanatory Report

The Groundwater Management Area 9 Joint Planning Committee (GMA-9 or the Committee) prepared the *Groundwater Management Area 9 Explanatory Report for Desired Future Conditions for Major and Minor Aquifers* to comply with the requirements of Section 36.108 (Joint Planning in Management Area) of the Texas Water Code (TWC), specifically Subsection 36.108 (d-3) (TWC §36.108 (d-3)). This Explanatory Report (ER) was prepared as a summary of the second round of joint planning as required by the TWC with GMA-9's adoption of Desired Future Conditions (DFCs) for certain major and minor aquifers in the management area (TWC §36.108).

To formally submit GMA-9's DFC actions to the Texas Water Development Board (TWDB), the members of GMA-9 are required to prepare and submit this ER, along with other documentation, in the official submission packet of information as outlined in Subsection 36.108 (d-3) of the TWC. This requirement applies to all 16 groundwater management areas (GMAs) in the State of Texas. All GMAs are required to meet at least annually to conduct joint planning. One of their assigned tasks is to review proposals to re-adopt the existing DFCs, adopt new DFCs, or amend the existing DFCs. At least every five years, GMAs are also required to consider technical and other data and propose DFCs to be adopted for the GMA. Before voting on any DFCs, Groundwater Conservation Districts (GCDs) are to consider nine factors listed in Subsection 36.108 (d) of the TWC.

Although not required by the TWC, GMA-9 also elected to address the proposed classifications of certain major and minor aquifers as non-relevant for the purposes of joint planning, as provided for in Title 31, Chapter 356 of the Texas Administrative Code (TAC), in this ER (31 TAC §356.31 (b)).

The GMA-9 ER represents a collective and cooperative effort by the members of GMA-9 to comply with the requirements of Section 36.108 of the TWC. It establishes and documents the foundational basis for the GMA-9 DFC decisions in this second round of joint planning made by the GCDs in GMA-9. Development of the ER was made possible through a joint funding agreement between the GCDs in GMA-9. It is not within the purview of either this ER, the joint planning process, or GMA-9 to address or resolve local GCD management issues as they may relate to a GMA-9 GCD's rules, management plan or programs.

Information in the GMA-9 Explanatory Report

Section 36.108 of the TWC requires GCDs to jointly develop and submit DFCs for the groundwater resources within their management area to the TWDB. As part of the process to develop DFCs, Subsection 36.108 (d-3) of the TWC requires district representatives to produce an ER for their GMA that, in summary, identifies each DFC and provides certain technical and policy justifications for these adopted DFCs. Section 36.108 of the TWC and Chapter 356 (Groundwater Management) of the TAC contain, among other provisions, substantive and procedural requirements regarding development of the DFCs and ER. The requirement to prepare and submit an ER is a new requirement implemented in this second round of joint planning.

Groundwater Management Area 9 Joint Planning Committee

As mentioned previously, GMA-9 is one of 16 GMAs in the State of Texas, and generally covers the Texas Hill Country area. The nine GCD members of GMA-9 are the:

- Bandera County River Authority and Groundwater District (BCRAGD);
- Barton Springs/Edwards Aquifer Conservation District (BSEACD);
- Blanco-Pedernales Groundwater Conservation District (BPGCD);
- Comal Trinity Groundwater Conservation District (CTGCD);
- Cow Creek Groundwater Conservation District (CCGCD);
- Hays Trinity Groundwater Conservation District (HTGCD);
- Headwaters Groundwater Conservation District (HGCD);
- Medina County Groundwater Conservation District (MCGCD); and
- Trinity Glen Rose Groundwater Conservation District (TGRGCD).

These nine GCDs operate as a planning entity for the purposes of conducting joint planning for GMA-9 as required by Section 36.108 of the TWC. GMA-9 also has two non-voting members. One of those non-voting members is the Edwards Aquifer Authority (EAA), and the other represents the geographic area covered by GMA-9 in western Travis County that is included in the Hill Country Priority Groundwater Management Area (PGMA) designated by the Texas Water Commission in 1990, but is not currently included in a GCD. The TWDB also designated one staff person, Dr. Rima Petrossian, to serve in a non-voting advisory capacity to GMA-9.

GMA-9 encompasses all or parts of Bandera, Bexar, Blanco, Comal, Hays, Kendall, Kerr, Medina, and Travis counties, and includes three major Texas river basins – the Colorado, Guadalupe, and Nueces river basins. The area is also divided among three of the State's 16 Regional Water Planning Groups (RWPGs), charged with developing Regional Water Plans (RWPs) for their Regional Water Planning Areas (RWPAs) to become part of the state water plan (SWP). The three RWPGs that overlay GMA-9 are the Plateau RWPG (Region J), the Lower Colorado RWPG (Region K), and the South Central Texas RPWG (Region L). The TWDB provides Modeled Available Groundwater (MAG) amounts to these three RWPGs, based upon the DFCs adopted by GMA-9, to incorporate these groundwater availability amounts into their RWPs and ultimately the SWP.

There are three major and three minor aquifers that underlie the geographic area that GMA-9 must consider in the joint planning process. Those aquifers are:

Major Aquifers

- Trinity Aquifer
- Edwards Group of the Edwards-Trinity (Plateau) Aquifer
- Edwards Aquifer (Balcones Fault Zone)

Minor Aquifers:

- Ellenburger-San Saba Aquifer
- Hickory Aquifer
- Marble Falls Aquifer

GMA-9 Second Round of Joint Planning Results

On April 18, 2016, GMA-9 voted to propose portions of certain major and minor aquifers within GMA-9 be classified as non-relevant for the purposes of joint planning (31 TAC §356.31 (b)), and adopted DFCs for the relevant aquifers pursuant to Section 36.108 of the TWC. **Table ES-1** and **Table ES-2** identify GMA-9's adopted proposed non-relevant aquifer classifications and DFCs, respectively, for the major and minor aquifers.

Table ES-1. Adopted GMA-9 Proposed Non-Relevant Aquifer Classifications (Major and Minor Aquifers)

PROPOSED NON-RELEVANT AQUIFER CLASSIFICATION	APPLICABLE AREAS WITHIN GMA-9 (ALL OR PORTIONS OF THE FOLLOWING COUNTIES, AS APPLICABLE)
Edwards Aquifer (Balcones Fault Zone)	Bexar, Comal, Hays, and Travis Counties
Edwards Group of Edwards-Trinity (Plateau)	Blanco and Kerr Counties
Ellenburger-San Saba	Blanco and Kerr Counties
Hickory	Blanco, Hays, Kerr, and Travis Counties
Marble Falls	Blanco County

Table ES-2. Adopted GMA-9 Desired Future Conditions (Major and Minor Aquifers)

MAJOR OR MINOR AQUIFER	DESIRED FUTURE CONDITION
Trinity	Allow For An Increase in Average Drawdown of Approximately 30 Feet Through 2060 (throughout GMA-9) Consistent With "Scenario 6" in TWDB GAM Task 10-005
Edwards Group of Edwards-Trinity (Plateau)	Allow For No Net Increase in Average Drawdown in Bandera and Kendall Counties Through 2070
Ellenburger-San Saba	Allow For An Increase in Average Drawdown of No More Than 2 Feet in Kendall County Through 2070
Hickory	Allow For An Increase in Average Drawdown of No More Than 7 Feet in Kendall County Through 2070

GMA-9 determined that the aquifer characteristics, groundwater demands, and current groundwater uses for all or portions of the aquifer as specified above in **Table ES-1** in GMA-9 do not warrant adopting a DFC. In these cases, Rule §356.31 (b) allows that a DFC is not required (31 TAC §356.31 (b)), and identifies certain information that must be submitted to the TWDB regarding these proposed classifications (31 TAC Rule §356.31 (b)). GMA-9 included detailed explanations for these determinations in this ER (**Chapter 5.0** – GMA-9 PROPOSED NON-RELEVANT AQUIFER CLASSIFICATIONS).

Subsection 36.108 (d-3) of the TWC requires that the ER must address five elements for each of these adopted DFCs. **Chapter 4.0** – GMA-9 JOINT PLANNING AND DESIRED FUTURE CONDITION DEVELOPMENT PROCESS, and **Chapter 6.0** – GMA-9 DESIRED FUTURE CONDITIONS of this ER

provide detailed discussions of these required elements. **Table ES-3** is a summary of the five elements for each DFC, and where those discussions are located in the GMA-9 ER.

Table ES-3. GMA-9 Adopted DFCs, Subsection 36.108 (d-3) Explanatory Report Required Elements, and GMA-9 ER Content

	Subsection 36.108 (d-3) Explanatory Report Required Elements and ER Locations				
GMA-9 DFC	**Identification of Each DFC – ER Content**	**DFC Policy and Technical Justifications – ER Content**	**Documentation of Nine Factors Considered and Adopted DFC Impact on Each Factor – ER Content**	**Other DFC Options Considered, and Reasons Not Adopted – ER Content**	**Reasons Recommendations by Advisory Committee Members and Relevant Public Comments Were or Were Not Incorporated Into DFCS – ER Content**
Trinity Aquifer	Table ES–2; Table 2; and Table 30	Chapter 6.0, Subsection 6.1.1	Chapter 4.0; Chapter 6.0, Subsection 6.1.3; and Appendix A	Chapter 4.0; Chapter 6.0, Subsection 6.1.4; and Appendix B	Chapter 6.0, Subsection 6.1.5; and Appendix B
Edwards Group of Edwards-Trinity (Plateau) Aquifer	Table ES–2; Table 2; and Table 30	Chapter 6.0, Subsection 6.1.2	Chapter 4.0; Chapter 6.0, Subsection 6.1.3; and Appendix A	Chapter 4.0; Chapter 6.0, Subsection 6.1.4; and Appendix B	Chapter 6.0, Subsection 6.1.5; and Appendix B
Ellenburger -San Saba Aquifer	Table ES–2; Table 2; and Table 30	Chapter 6.0, Subsection 6.2.1	Chapter 4.0; Chapter 6.0, Subsection 6.2.2; and Appendix A	Chapter 4.0; Chapter 6.0, Subsection 6.2.3; and Appendix B	Chapter 6.0, Subsection 6.2.4; and Appendix B
Hickory Aquifer	Table ES–2; Table 2; and Table 30	Chapter 6.0, Subsection 6.2.1	Chapter 4.0; Chapter 6.0, Subsection 6.2.2; and Appendix A	Chapter 4.0; Chapter 6.0, Subsection 6.2.3; and Appendix B	Chapter 6.0, Subsection 6.2.4; and Appendix B

GMA-9 Joint Planning and DFC Process Next Steps

GMA-9 will submit the adopted DFCs, the ER, and all other documentation to the TWDB and each GCD in GMA-9 as required by the TAC. The TWDB will then determine whether the information submitted to the TWDB is deemed to be administratively complete. TWDB staff developed the "Desired Future Condition Submission Packet Checklist – Administrative Completeness (Part 1 through Part 5)" to conduct their review of the ERs submitted by GMA-9, and all other GMAs.

To aid in the TWDB staff's review of this ER, GMA-9 partially completed the TWDB Checklist for Part 1 through Part 3 only, for only those checklist items that GMA-9 could provide assistance in locating the required information. GMA-9 did not complete the TWDB Checklist for Part 4 and Part 5 because GMA-9 did not perform any new Groundwater Availability Model (GAM) runs or prepare any new aquifer

assessments in this second joint planning cycle. **Table ES-4** through **Table ES-6** provide the partially-completed TWDB Checklist for Part 1 through Part 3 related to the GMA-9 ER.

Once the information submitted by GMA-9 is deemed to be administratively complete by the TWDB, each of the GMA-9 GCDs will then adopt the GMA-9 DFCs and ER that are relevant to that particular GCD. The TWDB will also provide MAG amounts to the three RWPGs identified above to be considered in the regional and state water planning processes, and to the GCDs to consider in managing their aquifers and as one element in making their permitting decisions.

Table ES-4. GMA-9 Partially-Completed TWDB Desired Future Condition Submission Packet Checklist - Administrative Completeness (Part 1)

Texas Water Development Board			
Desired Future Condition Submission Packet Checklist - Administrative Completeness (Part 1)			
Groundwater Management Area: GMA-9			
Reviewing Staff:		**Date Packet Received:**	
		Date E-mail Acknowledgement Sent:	
		Date Review Completed:	
	Citation of Rule	**Present in packet and administratively complete**	**Notes**
1. Is a copy of the explanatory report addressing the information required by Texas Water Code §36.108(d-3) and the criteria in Texas Water Code §36.108(d) included? *(refer to Explanatory Report checklist before responding)*	31 TAC §356.32(1)	Yes	GMA-9 ER: *Groundwater Management Area 9 Explanatory Report for Desired Future Conditions for Major and Minor Aquifers* (April 2016)
2. Is a copy of the resolution of the groundwater management area adopting the desired future conditions as required by Texas Water Code §36.108(d-3) included?	31 TAC §356.32(2)	Yes	GMA-9 ER: Appendix A
3. Is a copy of the notice that was posted for the joint planning meeting at which the districts collectively adopted the desired future condition(s) as required by Texas Water Code §36.108(e) and §36.108(e-2) included?	31 TAC §356.32(3)	Yes	GMA-9 ER: Appendix A
4. Is the name of a designated representative of the groundwater management area for TWDB staff to contact as necessary included?	31 TAC §356.32(4)	Yes	GMA-9 Cover Letter to TWDB Transmitting GMA-9 Adopted DFCs, ER, and Other Required Information

Table ES-4. GMA-9 Partially-Completed TWDB Desired Future Condition Submission Packet Checklist - Administrative Completeness (Part 1)

Texas Water Development Board			
Desired Future Condition Submission Packet Checklist - Administrative Completeness (Part 1)			
Groundwater Management Area: GMA-9			
Reviewing Staff:		**Date Packet Received:**	
		Date E-mail Acknowledgement Sent:	
		Date Review Completed:	
	Citation of Rule	**Present in packet and administratively complete**	**Notes**
5. Are any groundwater availability model files or aquifer assessments acceptable to the executive administrator used in developing the adopted desired future condition with documentation sufficient to replicate the work included? *(refer to the Groundwater Availability Model Administrative Elements checklist before responding)*	31 TAC §356.32(5)	Yes	GMA-9 ER: Chapter 4.0; and Table 13
6. Is any other information the executive administrator may require to be able to estimate the modeled available groundwater included?	31 TAC §356.32(6)	*Defer to TWDB Staff*	*Defer to TWDB Staff*
Mark elements that are present in the packet with YES			
Mark elements that are not applicable with NA			
Mark elements that are missing from the packet with NO			

Table ES-5. GMA-9 Partially-Completed TWDB Desired Future Condition Submission Packet Checklist - Groundwater Availability Model Administrative Elements (Part 2)

Texas Water Development Board			
Desired Future Condition Submission Packet Checklist - Groundwater Availability Model Administrative Elements (Part 2)			
Groundwater Management Area: GMA-9			
Reviewing Staff:		**Date Packet Received:**	
		Date Review Completed:	
	Citation of Rule	**Present in packet and administratively complete**	**Notes**
1. Is a descriptive narrative of the methods and references used to determine the desired future conditions included with the desired future condition statements?		Yes	GMA-9 ER: • Trinity Aquifer DFC - Chapter 4.0; and Chapter 6.0, Section 6.1 • Edwards Group of Edwards-Trinity (Plateau) Aquifer DFC - Chapter 4.0; and Chapter 6.0, Section 6.1 • Ellenburger-San Saba Aquifer DFC - Chapter 4.0; and Chapter 6.0, Section 6.2 • Hickory Aquifer DFC - Chapter 4.0; and Chapter 6.0, Section 6.2
2. Is any other information the executive administrator may require to be able to estimate the modeled available groundwater included?	31 TAC §356.32(6)	*Defer to TWDB Staff*	*Defer to TWDB Staff*
3. If item 2 is no, please list additional information required. (For example, model or GIS files necessary for review)		*Defer to TWDB Staff*	*Defer to TWDB Staff*
Mark elements that are present in the packet with YES Mark elements that are not applicable with NA Mark elements that are missing from the Packet with NO			

Table ES-6. GMA-9 Partially-Completed TWDB Desired Future Condition Submission Packet Checklist - Factors and Technical Elements (Part 3)

Texas Water Development Board			
Desired Future Condition Submission Packet Checklist - Factors and Technical Elements (Part 3)			
Groundwater Management Area: GMA-9			
Reviewing Staff:		**Date Packet Received:**	
		Date Review Completed:	
	Citation of Rule	**Present in packet and administratively complete**	**Notes**
1. Does the explanatory report identify each desired future condition?	TWC §36.108 (d-3)	Yes	GMA-9 ER: • Table ES-2; Table 2; and Table 30
2. Does the explanatory report provide the policy and technical justifications for each desired future condition?	TWC §36.108 (d-3)	Yes	GMA-9 ER: • Trinity Aquifer DFC - Chapter 6.0, Subsection 6.1.1 • Edwards Group of Edwards-Trinity (Plateau) Aquifer DFC - Chapter 6.0, Subsection 6.1.2 • Ellenburger-San Saba Aquifer DFC - Chapter 6.0, Subsection 6.2.1 • Hickory Aquifer DFC - Chapter 6.0, Subsection 6.2.1
3. Does the explanatory report include documentation that the factors under Subsection (d) were considered by the districts and a discussion of how the adopted desired future conditions impact each factor?	TWC §36.108 (d-3)	Yes	GMA-9 ER: • Trinity Aquifer DFC - Chapter 4.0; Chapter 6.0, Subsection 6.1.3; and Appendix A • Edwards Group of Edwards-Trinity (Plateau) Aquifer DFC - Chapter 4.0; Chapter 6.0, Subsection 6.1.3; and Appendix A • Ellenburger-San Saba Aquifer DFC - Chapter 4.0; Chapter 6.0, Subsection 6.2.2; and Appendix A • Hickory Aquifer DFC - Chapter 4.0; Chapter 6.0, Subsection 6.2.2; and Appendix A
3a. Did the districts consider aquifer uses or conditions within the management area, including conditions that differ substantially from one geographic area to another?	TWC§36.108 (d1)	Yes	GMA-9 ER: • Trinity Aquifer DFC - Chapter 6.0, Subsection 6.1.3.1 • Edwards Group of Edwards-Trinity (Plateau) Aquifer DFC - Chapter 6.0, Subsection 6.1.3.1 • Ellenburger-San Saba Aquifer DFC - Chapter 6.0, Subsection 6.2.2.1 • Hickory Aquifer DFC - Chapter 6.0, Subsection 6.2.2.1

Table ES-6. GMA-9 Partially-Completed TWDB Desired Future Condition Submission Packet Checklist - Factors and Technical Elements (Part 3)

Texas Water Development Board			
Desired Future Condition Submission Packet Checklist - Factors and Technical Elements (Part 3)			
Groundwater Management Area: GMA-9			
Reviewing Staff:		**Date Packet Received:**	
		Date Review Completed:	
3b. Did the districts consider the water supply needs and water management strategies included in the state water plan?	TWC§36.108 (d2)	Yes	GMA-9 ER: • Trinity Aquifer DFC - Chapter 6.0, Subsection 6.1.3.2 • Edwards Group of Edwards-Trinity (Plateau) Aquifer DFC - Chapter 6.0, Subsection 6.1.3.2 • Ellenburger-San Saba Aquifer DFC - Chapter 6.0, Subsection 6.2.2.2 • Hickory Aquifer DFC - Chapter 6.0, Subsection 6.2.2.2
3c. Did the districts consider hydrological conditions, including for each aquifer in the management area the total estimated recoverable storage as provided by the executive administrator, and the average annual recharge, inflows, and discharge?	TWC§36.108 (d3)	Yes	GMA-9 ER: • Trinity Aquifer DFC - Chapter 6.0, Subsection 6.1.3.3 • Edwards Group of Edwards-Trinity (Plateau) Aquifer DFC - Chapter 6.0, Subsection 6.1.3.3 • Ellenburger-San Saba Aquifer DFC - Chapter 6.0, Subsection 6.2.2.3 • Hickory Aquifer DFC - Chapter 6.0, Subsection 6.2.2.3
3d. Did the districts consider other environmental impacts, including impacts on spring flow and other interactions between groundwater and surface water?	TWC§36.108 (d4)	Yes	GMA-9 ER: • Trinity Aquifer DFC - Chapter 6.0, Subsection 6.1.3.4 • Edwards Group of Edwards-Trinity (Plateau) Aquifer DFC - Chapter 6.0, Subsection 6.1.3.4 • Ellenburger-San Saba Aquifer DFC - Chapter 6.0, Subsection 6.2.2.4 • Hickory Aquifer DFC - Chapter 6.0, Subsection 6.2.2.4
3e. Did the districts consider the impact on subsidence?	TWC§36.108 (d5)	Yes	GMA-9 ER: • Trinity Aquifer DFC - Chapter 6.0, Subsection 6.1.3.5 • Edwards Group of Edwards-Trinity (Plateau) Aquifer DFC - Chapter 6.0, Subsection 6.1.3.5 • Ellenburger-San Saba Aquifer DFC - Chapter 6.0, Subsection 6.2.2.5 • Hickory Aquifer DFC - Chapter 6.0, Subsection 6.2.2.5

Table ES-6. GMA-9 Partially-Completed TWDB Desired Future Condition Submission Packet Checklist - Factors and Technical Elements (Part 3)

Texas Water Development Board			
Desired Future Condition Submission Packet Checklist - Factors and Technical Elements (Part 3)			
Groundwater Management Area: GMA-9			
Reviewing Staff:		**Date Packet Received:**	
		Date Review Completed:	
3f. Did the districts consider socioeconomic impacts reasonably expected to occur?	TWC§36.108 (d6)	Yes	GMA-9 ER: • Trinity Aquifer DFC - Chapter 6.0, Subsection 6.1.3.6 • Edwards Group of Edwards-Trinity (Plateau) Aquifer DFC - Chapter 6.0, Subsection 6.1.3.6 • Ellenburger-San Saba Aquifer DFC - Chapter 6.0, Subsection 6.2.2.6 • Hickory Aquifer DFC - Chapter 6.0, Subsection 6.2.2.6
3g. Did the districts consider the impact on the interests and rights in private property, including ownership and the rights of management area landowners and their lessees and assigns in groundwater as recognized under Section 36.002?	TWC§36.108 (d7)	Yes	GMA-9 ER: • Trinity Aquifer DFC - Chapter 6.0, Subsection 6.1.3.7 • Edwards Group of Edwards-Trinity (Plateau) Aquifer DFC - Chapter 6.0, Subsection 6.1.3.7 • Ellenburger-San Saba Aquifer DFC - Chapter 6.0, Subsection 6.2.2.7 • Hickory Aquifer DFC - Chapter 6.0, Subsection 6.2.2.7
3h. Did the districts consider the feasibility of achieving the desired future condition?	TWC§36.108 (d8)	Yes	GMA-9 ER: • Trinity Aquifer DFC - Chapter 6.0, Subsection 6.1.3.8 • Edwards Group of Edwards-Trinity (Plateau) Aquifer DFC - Chapter 6.0, Subsection 6.1.3.8 • Ellenburger-San Saba Aquifer DFC - Chapter 6.0, Subsection 6.2.2.8 • Hickory Aquifer DFC - Chapter 6.0, Subsection 6.2.2.8
3i. Did the districts consider any other information relevant to the specific desired future conditions?	TWC§36.108 (d9)	Yes	GMA-9 ER: • Trinity Aquifer DFC - Chapter 6.0, Subsection 6.1.3.9 • Edwards Group of Edwards-Trinity (Plateau) Aquifer DFC - Chapter 6.0, Subsection 6.1.3.9 • Ellenburger-San Saba Aquifer DFC - Chapter 6.0, Subsection 6.2.2.9 • Hickory Aquifer DFC - Chapter 6.0, Subsection 6.2.2.9

Table ES-6. GMA-9 Partially-Completed TWDB Desired Future Condition Submission Packet Checklist - Factors and Technical Elements (Part 3)

Texas Water Development Board			
Desired Future Condition Submission Packet Checklist - Factors and Technical Elements (Part 3)			
Groundwater Management Area: GMA-9			
Reviewing Staff:		**Date Packet Received:**	
		Date Review Completed:	
4. Does the explanatory report list other desired future condition options considered, if any, and the reasons why those options were not adopted?	TWC §36.108 (d-3)(4)	Yes	GMA-9 ER: • Trinity Aquifer DFC - Chapter 4.0; Chapter 6.0, Subsection 6.1.4; and Appendix B • Edwards Group of Edwards-Trinity (Plateau) Aquifer DFC - Chapter 4.0; Chapter 6.0, Subsection 6.1.4; and Appendix B • Ellenburger-San Saba Aquifer DFC - Chapter 4.0; Chapter 6.0, Subsection 6.2.3; and Appendix B • Hickory Aquifer DFC - Chapter 4.0; Chapter 6.0, Subsection 6.2.3; and Appendix B
5. Does the explanatory report discuss reasons why recommendations made by advisory committees and relevant public comments received by the districts were or were not incorporated into the desired future conditions?	TWC §36.108 (d-)(5)	Yes	GMA-9 ER: • Trinity Aquifer DFC - Chapter 6.0, Subsection 6.1.5; and Appendix B • Edwards Group of Edwards-Trinity (Plateau) Aquifer DFC - Chapter 6.0, Subsection 6.1.5; and Appendix B • Ellenburger-San Saba Aquifer DFC - Chapter 6.0, Subsection 6.2.4; and Appendix B • Hickory Aquifer DFC - Chapter 6.0, Subsection 6.2.4; and Appendix B
Mark elements that are present in the packet with YES Mark elements that are missing from the packet with NO			

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1.0 INTRODUCTION

The Groundwater Management Area 9 Joint Planning Committee (GMA-9 or the Committee) prepared the *Groundwater Management Area 9 Explanatory Report for Desired Future Conditions for Major and Minor Aquifers* to comply with the requirements of Section 36.108 (Joint Planning in Management Area) of the Texas Water Code (TWC), specifically Subsection 36.108 (d-3) (TWC §36.108 (d-3)). This Explanatory Report (ER) was prepared as a summary of the second round of joint planning as required by the TWC (TWC §36.108).

Chapter 1.0 – INTRODUCTION of this Explanatory Report (ER) provides an overview of: 1) the results of the second round of joint planning for GMA-9; 2) why the GMA-9 Groundwater Conservation Districts (GCDs) conduct joint planning; 3) why this ER was prepared by GMA-9; and 4) a discussion of the scope of this ER.

The nine GMA-9 members GCDs are the:

- Bandera County River Authority and Groundwater District (BCRAGD);
- Barton Springs/Edwards Aquifer Conservation District (BSEACD);
- Blanco-Pedernales Groundwater Conservation District (BPGCD);
- Comal Trinity Groundwater Conservation District (CTGCD);
- Cow Creek Groundwater Conservation District (CCGCD);
- Hays Trinity Groundwater Conservation District (HTGCD);
- Headwaters Groundwater Conservation District (HGCD);
- Medina County Groundwater Conservation District (MCGCD); and
- Trinity Glen Rose Groundwater Conservation District (TGRGCD).

GMA-9 also two non-voting members. When the second round of joint planning began, the Edwards Aquifer Authority (EAA) was a GMA-9 voting member. However, the EAA was removed from the joint planning process by legislative action in 2015 with the passage of Senate Bill Number (S.B. No.) 1336, and is no longer a formal part of the joint planning process moving forward. The other non-voting member represents the geographic area covered by GMA-9 in western Travis County that is included in the Hill Country Priority Groundwater Management Area (PGMA) as designated by the Texas Water Commission in 1990. This area within GMA-9 is not currently included in a GCD. A description of GMA-9 will be provided later in this ER (**Chapter 2.0 –** GMA-9 DESCRIPTION).

On April 18, 2016, GMA-9 voted to propose portions of certain major and minor aquifers within GMA-9 be classified as non-relevant for the purposes of joint planning (31 TAC §356.31 (b)), and adopted DFCs for the relevant aquifers pursuant to Section 36.108 of the TWC. **Table 1** and **Table 2** identify GMA-9's adopted proposed non-relevant aquifer classifications and DFCs, respectively, for the major and minor aquifers.

Table 1. Adopted GMA-9 Proposed Non-Relevant Aquifer Classifications (Major and Minor Aquifers)

PROPOSED NON-RELEVANT AQUIFER CLASSIFICATION	APPLICABLE AREAS WITHIN GMA-9 (ALL OR PORTIONS OF THE FOLLOWING COUNTIES, AS APPLICABLE)
Edwards Aquifer (Balcones Fault Zone)	Bexar, Comal, Hays, and Travis Counties
Edwards Group of Edwards-Trinity (Plateau)	Blanco and Kerr Counties
Ellenburger-San Saba	Blanco and Kerr Counties
Hickory	Blanco, Hays, Kerr, and Travis Counties
Marble Falls	Blanco County

Table 2. Adopted GMA-9 Desired Future Conditions (Major and Minor Aquifers)

MAJOR OR MINOR AQUIFER	DESIRED FUTURE CONDITION
Trinity	Allow For An Increase in Average Drawdown of Approximately 30 Feet Through 2060 (throughout GMA-9) Consistent With "Scenario 6" in TWDB GAM Task 10-005
Edwards Group of Edwards-Trinity (Plateau)	Allow For No Net Increase in Average Drawdown in Bandera and Kendall Counties Through 2070
Ellenburger-San Saba	Allow For An Increase in Average Drawdown of No More Than 2 Feet in Kendall County Through 2070
Hickory	Allow For An Increase in Average Drawdown of No More Than 7 Feet in Kendall County Through 2070

To formally submit the above-stated GMA-9 DFCs to the Texas Water Development Board (TWDB), the members of GMA-9 are required to prepare and submit this ER, along with other documentation, in the official submission packet of information as outlined in Subsection 36.108 (d-3) of the TWC.

1.1 Background

Section 36.108 of the TWC requires GCDs to jointly develop and submit DFCs for the groundwater resources within their management area to the TWDB. As part of the process to develop DFCs, Subsection 36.108 (d-3) of the TWC requires district representatives to produce an ER for their management area that, in summary, identifies each DFC and provides certain technical and policy considerations and justifications for these adopted DFCs.

Section 36.108 of the TWC and Chapter 356 (Groundwater Management) of the TAC contain, among other provisions, substantive and procedural requirements regarding development of the DFCs and ER. Specifically, Subsection 36.108 (d), and Subsections 36.108 (d-1) through 36.108 (d-5) of the TWC provide guidance to GCDs and GMAs regarding DFC consideration and adoption, and ER content and deadlines. Title 31, Chapter 356, Subchapter C of the TAC provides similar direction regarding the TWDB's requirements for submitting DFCs and the ER to the agency. A detailed discussion of these statutory and regulatory requirements is provided later in this report (**Chapter 3.0 –** STATUTORY AND REGULATORY REQUIREMENTS RELATED TO JOINT PLANNING AND DESIRED FUTURE CONDITIONS).

The requirement to prepare and submit an ER is a new requirement implemented in this second round of joint planning. Specifically, Subsection 36.108 (d-3) requires:

". . . The district representatives shall produce a desired future conditions explanatory report for the management area and submit to the development board and each district in the management area proof that notice was posted for the joint planning meeting, a copy of the resolution, and a copy of the explanatory report. The report must:

(1) identify each desired future condition;

(2) provide the policy and technical justifications for each desired future condition;

(3) include documentation that the factors under Subsection (d) were considered by the districts and a discussion of how the adopted desired future conditions impact each factor;

(4) list other desired future condition options considered, if any, and the reasons why those options were not adopted; and

(5) discuss reasons why recommendations made by advisory committees and relevant public comments received by the districts were or were not incorporated into the desired future conditions," (TWC §36.108 (d-3), p. 51).

Table 3 is a summary of the five elements for each DFC, and where those discussions are located in the GMA-9 ER.

Table 3. GMA-9 Adopted DFCs, Subsection 36.108 (d-3) Explanatory Report Required Elements, and GMA-9 ER Content

	Subsection 36.108 (d-3) Explanatory Report Required Elements and ER Locations				
GMA-9 DFC	**Identification of Each DFC – ER Content**	**DFC Policy and Technical Justifications – ER Content**	**Documentation of Nine Factors Considered and Adopted DFC Impact on Each Factor – ER Content**	**Other DFC Options Considered, and Reasons Not Adopted – ER Content**	**Reasons Recommendations by Advisory Committee Members and Relevant Public Comments Were or Were Not Incorporated Into DFCS – ER Content**
Trinity Aquifer	Table ES–2; Table 2; and Table 30	Chapter 6.0, Subsection 6.1.1	Chapter 4.0; Chapter 6.0, Subsection 6.1.3; and Appendix A	Chapter 4.0; Chapter 6.0, Subsection 6.1.4; and Appendix B	Chapter 6.0, Subsection 6.1.5; and Appendix B
Edwards Group of Edwards-Trinity (Plateau) Aquifer	Table ES–2; Table 2; and Table 30	Chapter 6.0, Subsection 6.1.2	Chapter 4.0; Chapter 6.0, Subsection 6.1.3; and Appendix A	Chapter 4.0 Chapter 6.0, Subsection 6.1.4; and Appendix B	Chapter 6.0, Subsection 6.1.5; and Appendix B

Table 3. GMA-9 Adopted DFCs, Subsection 36.108 (d-3) Explanatory Report Required Elements, and GMA-9 ER Content

GMA-9 DFC	Subsection 36.108 (d-3) Explanatory Report Required Elements and ER Locations				
	Identification of Each DFC – ER Content	DFC Policy and Technical Justifications – ER Content	Documentation of Nine Factors Considered and Adopted DFC Impact on Each Factor – ER Content	Other DFC Options Considered, and Reasons Not Adopted – ER Content	Reasons Recommendations by Advisory Committee Members and Relevant Public Comments Were or Were Not Incorporated Into DFCS – ER Content
Ellenburger -San Saba Aquifer	Table ES–2; Table 2; and Table 30	Chapter 6.0, Subsection 6.2.1	Chapter 4.0; Chapter 6.0, Subsection 6.2.2; and Appendix A	Chapter 4.0; Chapter 6.0, Subsection 6.2.3; and Appendix B	Chapter 6.0, Subsection 6.2.4; and Appendix B
Hickory Aquifer	Table ES–2; Table 2; and Table 30	Chapter 6.0, Subsection 6.2.1	Chapter 4.0; Chapter 6.0, Subsection 6.2.2; and Appendix A	Chapter 4.0; Chapter 6.0, Subsection 6.2.3; and Appendix B	Chapter 6.0, Subsection 6.2.4; and Appendix B

The GMA-9 ER not only addresses the elements required by Subsection 36.108 (d-3) listed above, but will first discuss GMA-9's adopted proposals of non-relevant aquifer classifications as they relate to the major or minor aquifers within GMA-9 (**Chapter 5.0 –** GMA-9 PROPOSED NON-RELEVANT AQUIFER CLASSIFICATIONS).

1.2 Scope of GMA-9 Explanatory Report

The GMA-9 ER represents a collective and cooperative effort by the members of GMA-9 to comply with the requirements of Section 36.108 of the TWC. It also establishes and documents the foundational basis for the GMA-9 DFC decisions in this second round of joint planning by the GCDs. The results of this second round of joint planning represent a coordinated effort by the GMA-9 GCDs to consider and establish long-term goals for managing the groundwater resources within the management area, and to provide these DFCs to the TWDB to use in determining Modeled Available Groundwater (MAG)[1] amounts to be considered in the regional and state water planning processes, and by the GCDs in managing their aquifers and as one element in making their permitting decisions.

GMA-9's goals for the ER were to prepare a report that would comply with the requirements of the TWC and TAC, prepare and submit a report documenting GMA-9's open and transparent process to conduct joint planning and develop the DFCs, and establish an administrative record for this process. As previously stated, GMA-9 elected to address both the proposed classifications of certain major and minor aquifers as

[1] Chapter 36 of the TWC was amended in the 82nd Session of the Texas Legislature with the passage of Senate Bill No. 737. This legislation amended the previous term and definition of "Managed Available Groundwater" to the current term and meaning of "Modeled Available Groundwater."

non-relevant for the purposes of joint planning (31 TAC §356.31 (b)), and the adopted DFCs for the relevant major and minor aquifers in GMA-9, in this ER.

GMA-9 will submit the adopted DFCs, the ER, and all other documentation to the TWDB and each GCD as required by the TWC and the TAC. The TWDB will then determine whether the information submitted is deemed to be administratively complete. Once the information submitted by GMA-9 is deemed to be administratively complete by the TWDB, each of the GMA-9 GCDs will then adopt the GMA-9 DFCs and ER that are relevant to that particular GCD. The TWDB will also provide MAG amounts to the three RWPGs identified above and to the GMA-9 GCDs.

TWDB staff developed the "Desired Future Condition Submission Packet Checklist – Administrative Completeness (Part 1 through Part 5)" to conduct their review of the ERs submitted by GMA-9, and all other GMAs. To aid in the TWDB staff's review of this ER, GMA-9 partially completed the TWDB Checklist for Part 1 through Part 3 only, for only those checklist items that GMA-9 could provide assistance in locating the required information. GMA-9 did not complete the TWDB Checklist for Part 4 and Part 5 because GMA-9 did not perform any new Groundwater Availability Model (GAM) runs or prepare any new aquifer assessments in this second joint planning cycle. **Table ES-4** through **Table ES-6** located in the EXECUTIVE SUMMARY of this ER provide the partially-completed TWDB Checklist for Part 1 through Part 3 related to the GMA-9 ER.

Development of the ER was made possible through a joint funding agreement between the GCDs in GMA-9. This ER was developed using publicly-available information and materials.

Lastly, it is not within the purview of either this ER, the joint planning process, or GMA-9 to address or resolve local GCD management issues as they may relate to a GMA-9 GCD's rules, management plan or programs.

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2.0 GMA-9 DESCRIPTION

Chapter 2.0 – GMA-9 DESCRIPTION, of this ER will review the: 1) groundwater management area designations; 2) purpose of joint planning; 3) role of GCDs in joint planning; 4) composition of GMA-9; and 5) major and minor aquifers, as designated by the TWDB, located within GMA-9.

2.1 Groundwater Management Areas and Groundwater Conservation Districts

GMA-9 is one of 16 groundwater management areas (GMAs) created in the State of Texas (Acts 2001, 77th Leg., Ch. 966, Sec. 2.46, eff. Sept. 1, 2001). In 2001, Chapter 35 of the TWC was amended to require that the TWDB designate GMAs covering all of the major and minor aquifers in the State by September 1, 2003. The GMAs were to be *"designated with the objective of providing the most suitable area for the management of the groundwater resources,"* and *"to the extent feasible, the groundwater management area shall coincide with the boundaries of a groundwater reservoir or a subdivision of a groundwater reservoir"* (TWC §35.004 (a), p.3). The initial boundaries of the GMAs were established by the TWDB on December 15, 2002, and are modified in accordance with Rule §356.21 (31 TAC §356.21). **Figure 1** shows the current boundary designations for the 16 groundwater management areas in the State.

Subsection 36.108 (c) of the TWC states:

"(c) The district representatives shall meet at least annually to conduct joint planning with the other districts in the management area and to review the management plans, the accomplishments of the management area, and proposals to adopt new or amend existing desired future conditions. In reviewing the management plans, the districts shall consider:

(1) the goals of each management plan and its impact on planning throughout the management area;

(2) the effectiveness of the measures established by each district's management plan for conserving and protecting groundwater and preventing waste, and the effectiveness of these measures in the management area generally;

(3) any other matters that the boards consider relevant to the protection and conservation of groundwater and the prevention of waste in the management area; and

(4) the degree to which each management plan achieves the desired future conditions established during the joint planning process," (TWC §36.108 (c), pp. 48-49).

GCDs are the State's preferred method of groundwater management as provided for in Subsection 36.0015 of the TWC. Subsection 36.0015 also states that GCDs are to manage the groundwater resources within their jurisdiction through rules developed and implemented in accordance with Chapter 36 of the TWC (TWC §36.0015). Chapter 36 establishes directives for GCDs and gives them the authority necessary to protect and preserve the groundwater resources within their boundaries. In managing these resources, GCDs give consideration to socioeconomic, environmental and private property rights factors and other issues, and balance these considerations along with the need for continued use of the groundwater. GCDs are required to adopt Groundwater Management Plans (GMPs) and rules, and they must incorporate the adopted

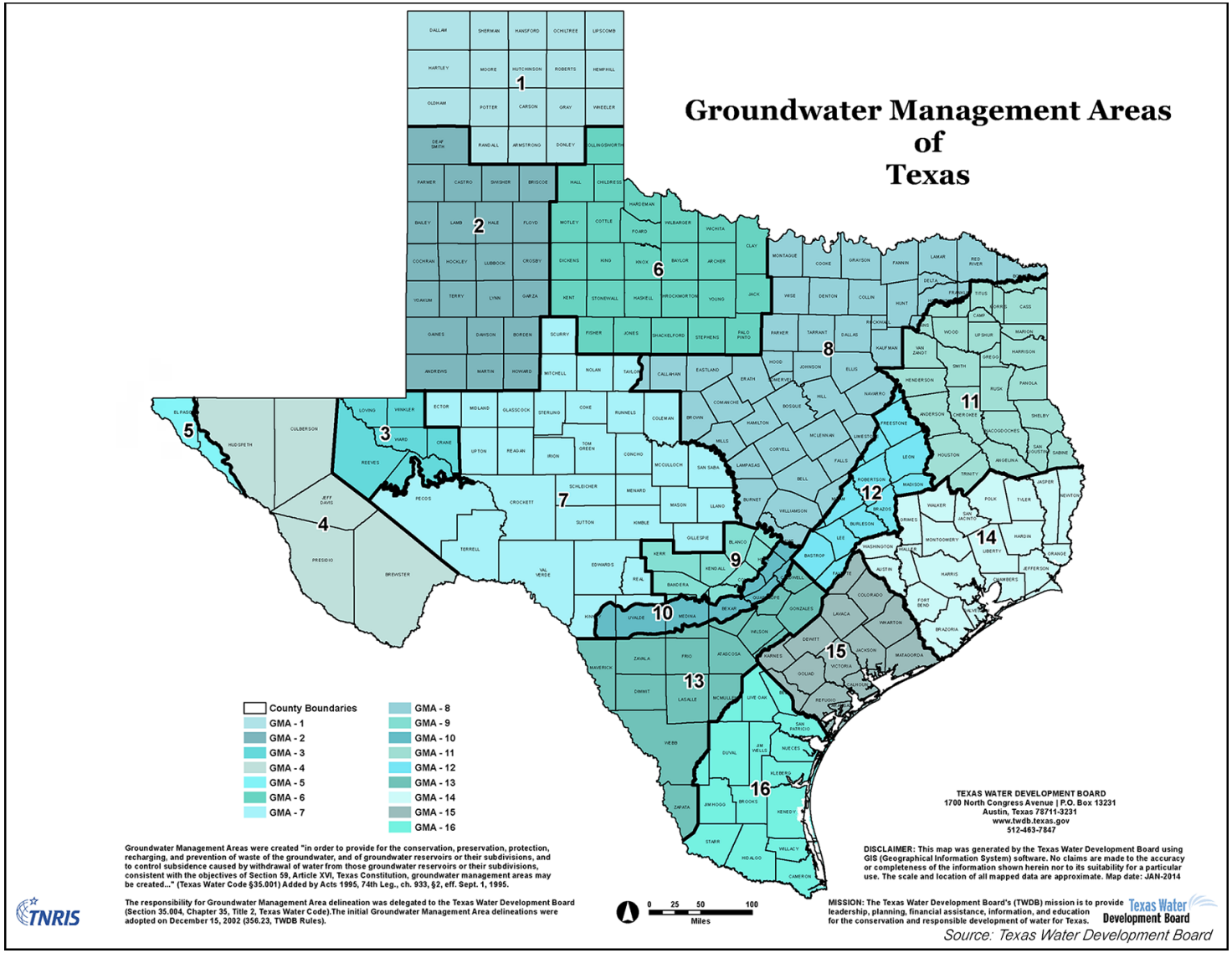

Figure 1. Sixteen Groundwater Management Areas in the State of Texas.

DFCs and resulting MAG amounts provided by the TWDB into their GMPs and rules. Among the many powers granted to GCDs, they are responsible for well permitting, well monitoring, data collection, and well spacing and limits on production as outlined in Chapter 36 of the TWC.

2.2 GMA-9 Membership and Boundary Descriptions

As previously stated, GMA-9's nine voting-member GCDs operate as a planning entity for the purposes of conducting joint planning for their management area as required by Section 36.108 of the TWC. The nine GCDs are listed in **Chapter 1.0** – INTRODUCTION of this ER, and their boundaries are depicted in **Figure 2**.

Some of the GCDs in GMA-9 are also assigned to other GMAs with multiple GCDs participating in those other GMAs. This mandated participation requires additional joint planning coordination and expenses for GMA-9 GCDs in these other GMAs. For example, the MCGCD is also a member of GMA 10 (nine GCDs are members of this GMA) and GMA 13 (nine GCDs are members of this GMA), the CTGCD is also a member of GMA 10 (nine GCDs are members of this GMA), and the BSEACD is also a member of GMA 10 (nine GCDs are members of this GMA). Prior to legislative action in 2015 to be discussed later in this ER, the EAA had also been a member of GMA 7 (21 GCDs are members of this GMA), GMA 10 (nine GCDs are members of this GMA), and GMA 13 (nine GCDs are members of this GMA).

For the first round of joint planning completed by the statutory September 1, 2010 deadline, the TWDB provided technical support to the GMAs and GCDs as they considered and developed their DFCs. In this second round of planning, the TWDB did not provide this assistance to the GMAs or GCDs, who now provide the funding to pay for all technical analyses, and funding to prepare the required ER. These costs are substantial in comparison to the average GCD operating budget. For those GCDs assigned to multiple GMAs, the combined added costs are significant.

GMA-9 also includes part of one county not currently covered by a GCD – western Travis County. The Texas Hill Country Area that includes all of GMA-9 was declared a Critical Groundwater Area by the Texas Water Commission in 1990. This designation is known as the Hill Country PGMA. A representative from this area designated by Travis County served as a non-voting member of GMA-9 during the second planning cycle.

When GMA-9 initiated this second round of joint planning, the western part of Comal County was also not included in a GCD. However, legislation passed during the 84th Session of the Texas Legislature, House Bill Number (H.B. No.) 2407, in 2015 created the CTGCD, so that this area as of June 17, 2015, was represented by a voting member on GMA-9. Prior to the GCD's creation, a representative from this area designated by Comal County served as a non-voting member during part of this second planning cycle.

For the majority of this second joint planning cycle, the EAA was also a voting member of GMA-9. However, in 2015, the EAA was removed from the joint planning process by legislative action with the passage of S.B. No. 1336, and while this entity will no longer be a formal part of the joint planning process

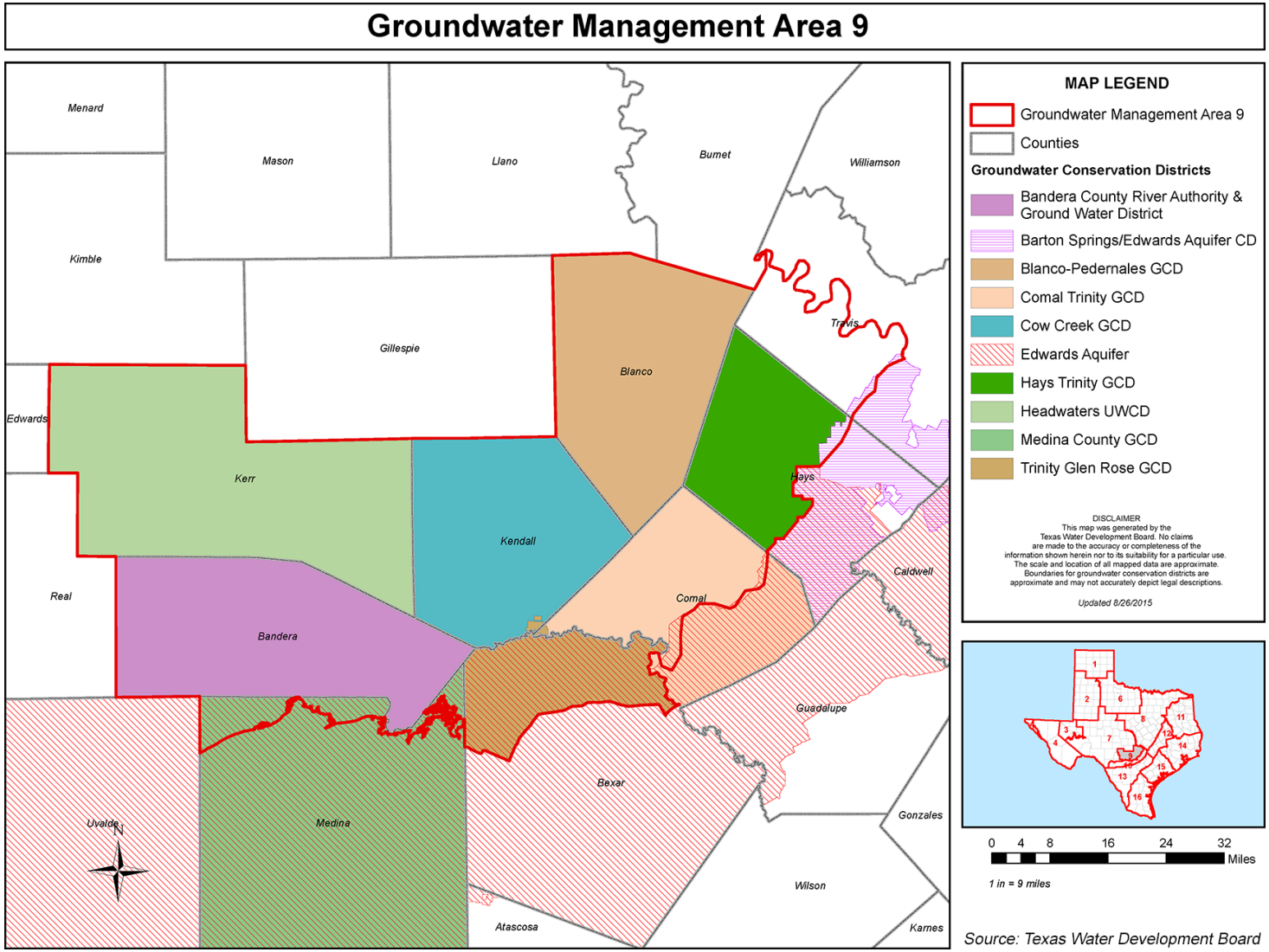

Figure 2. Nine GMA-9 Groundwater Conservation Districts and boundaries.

moving forward, the EAA will serve as a non-voting member of GMA-9. With the exception of the portion of western Travis County, all of GMA-9 is now under the jurisdiction of a GCD. Lastly, the TWDB designated one staff member, Dr. Rima Petrossian, to serve in a non-voting advisory capacity to GMA-9.

For more information regarding each GCD, please refer to the following GMP adopted by each GCD and summarized in **Table 4**.

Table 4. GMA-9 Groundwater Conservation District Groundwater Management Plan Summary

GMA-9 GCD	GMP Adoption or Amendment Date	TWDB Approval Date
BCRAGD	April 11, 2013	May 28, 2013
BSEACD	September 27, 2013	January 7, 2013
BPGCD	November 21, 2013	January 8, 2014
CCGCD	January 20, 2015	February 2, 2015
CTGCD[2]	N/A	N/A
HTGCD	January 28, 2016	February 19, 2016
HGCD	December 12, 2012	February 13, 2013
MCGCD	January 19, 2011	April 13, 2011
TGRGCD	November 12, 2015	January 14, 2016

Sources: GCD Groundwater Management Plans and TWDB Website

The GMPs listed in **Table 4** were used to prepare this ER and will be referenced later on in this document.

GMA-9 is located in central Texas and includes most of the Texas Hill Country. GMA-9 encompasses all or parts of the following counties: Bandera, Bexar, Blanco, Comal, Hays, Kendall, Kerr, Medina, and Travis counties (**Figure 3**).

The geographic area covered by GMA-9 also includes three major Texas river basins – the Colorado, Guadalupe, and Nueces River basins, and is also divided among three of the State's 16 Regional Water Planning Groups (RWPGs), charged with developing Regional Water Plans (RWPs) for their Regional Water Planning Areas (RWPAs) to become part of the State Water Plan (SWP). The three RWPGs that overlay GMA-9 are the Plateau RWPG (Region J), the Lower Colorado RWPG (Region K), and the South Central Texas RPWG (Region L) (**Figure 4**).

These three RWPGs cover all or parts of 41 counties in central Texas. For GMA-9, all of two counties (Bandera and Kerr counties) are among the six counties in Region J, all or parts of three counties (Blanco, Hays, and Travis counties) are among the 14 counties in Region K, and all or parts of five counties (Bexar,

[2] Subsection 36.1072 (a-1) (Texas Water Development Board Review and Approval of Management Plan) of the Texas Water Code allows newly-created GCDs to submit GMPs to the TWDB Executive Administrator no later than three years after their creation or confirmation election date, as applicable (Texas Water Code, Subsection 36.1072 (a-1). The CTCGD was created on June 17, 2015, as this legislation became effective immediately upon passage. Therefore, the CTCGD's GMP is not due to the TWDB until June 17, 2018.

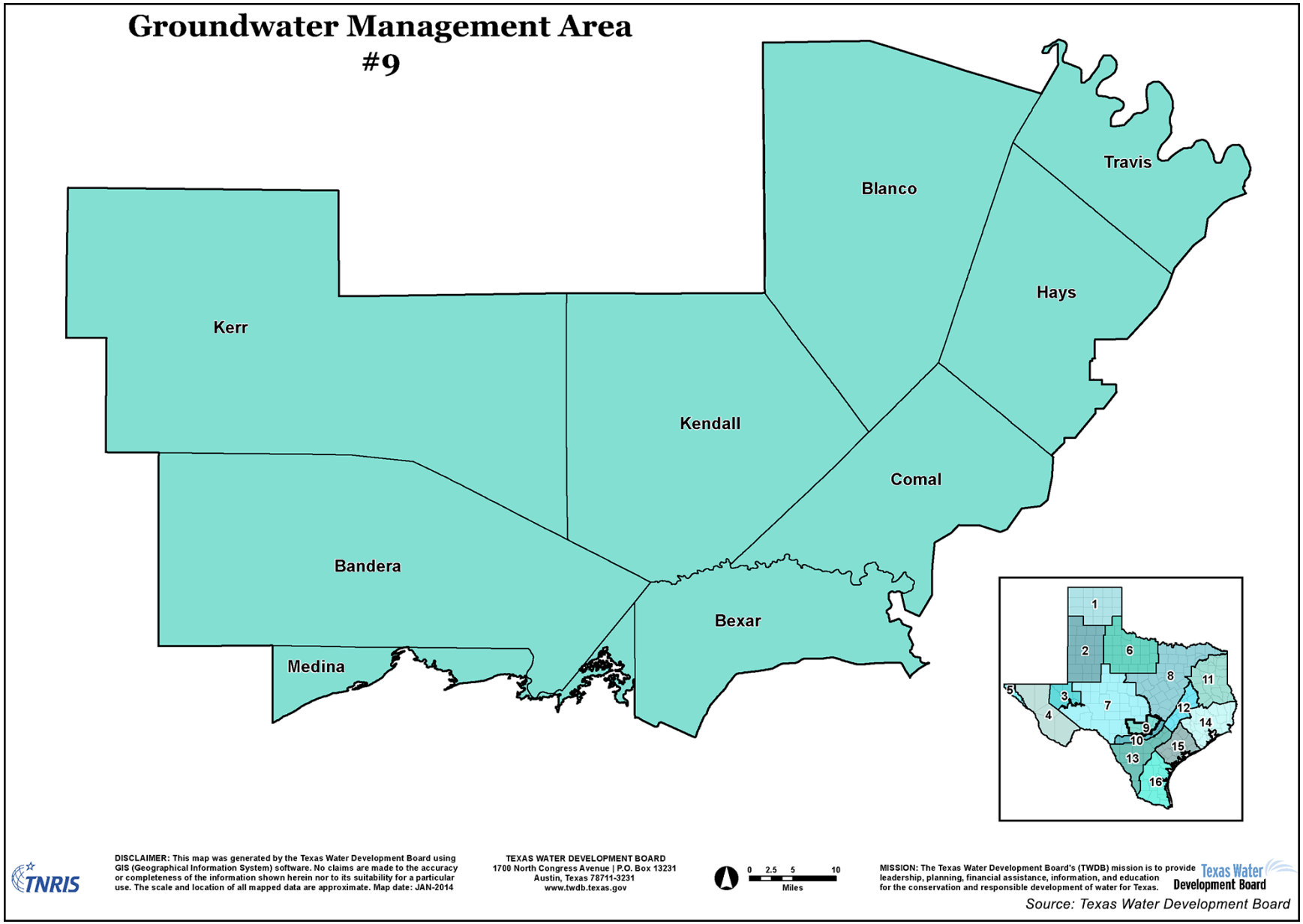

Figure 3. All or parts of nine counties in GMA-9.

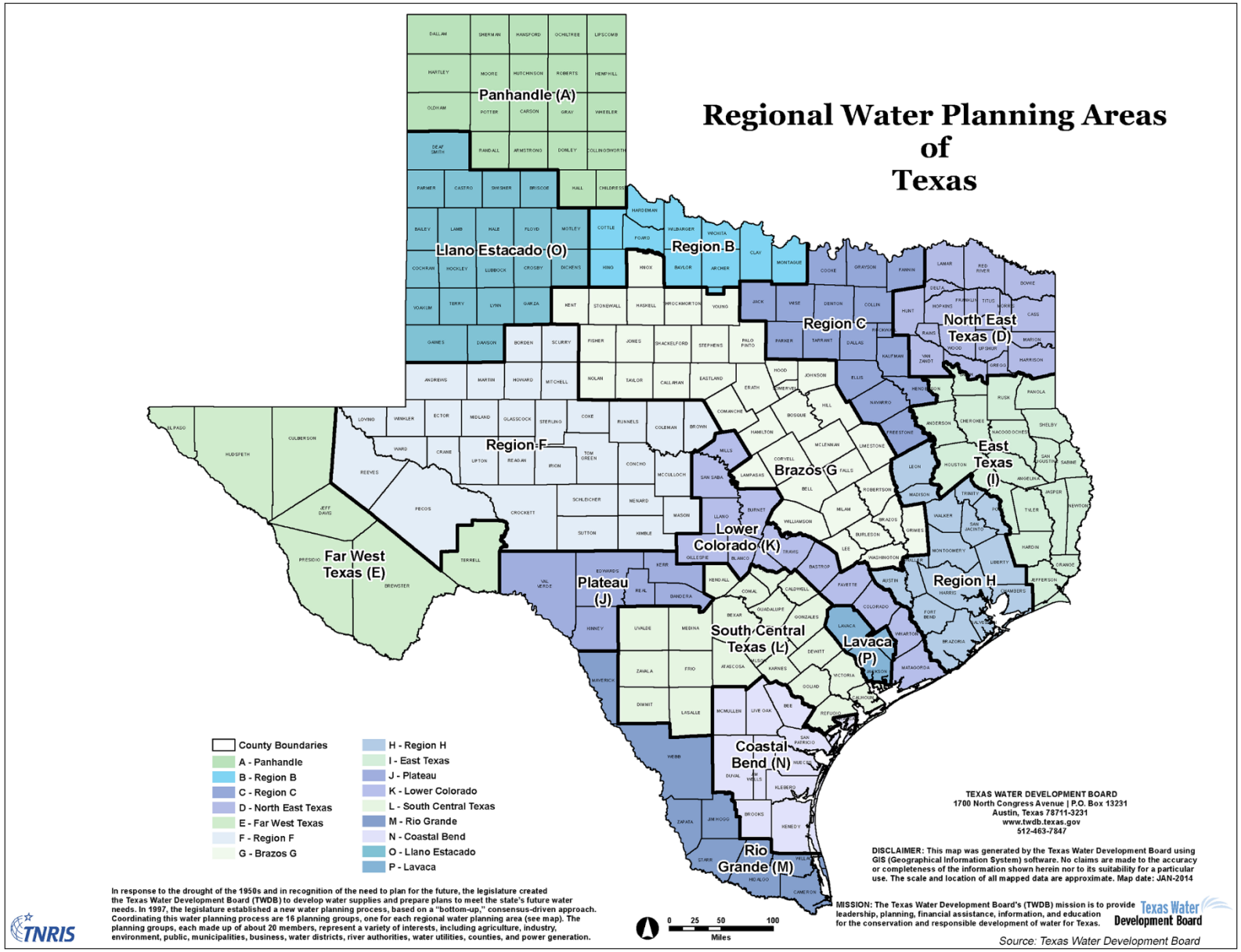

Figure 4. Sixteen Regional Water Planning Groups in the State of Texas.

Comal, Hays, Kendall, and Medina counties) are among the 21 counties in Region L. The TWDB provides MAG amounts to these three RWPGs based upon the DFCs adopted by GMA-9 to incorporate the MAG amounts into their RWPs, and ultimately the SWP. The RWPGs consider the GMA-9 MAGs, as well as other MAGs established for the RWPAs, surface water availability and other supplies, as available water to meet water supply needs and water management strategies to be included in the RWPs. The implications of these groundwater availability amounts as part of the RWP process will be discussed later in this ER under **Chapter 6.0** – GMA-9 DESIRED FUTURE CONDITIONS, **Subsection 6.1.3.2** – The Water Supply Needs and Water Management Strategies included in the State Water Plan.

2.3 Aquifer Descriptions

There are three major and three minor aquifers that underlie GMA-9. The following is a listing of these groundwater resources within GMA-9:

Major Aquifers

- Trinity Aquifer
- Edwards Group of the Edwards-Trinity (Plateau) Aquifer
- Edwards Aquifer (Balcones Fault Zone)

Minor Aquifers

- Ellenburger-San Saba Aquifer
- Hickory Aquifer
- Marble Falls Aquifer

A brief description and map of each of these aquifers is provided in the following discussion.

2.3.1 Major Aquifers

2.3.1.1 Trinity Aquifer

The Trinity Aquifer system is composed of deposits of sand, clay, and limestone of the Glen Rose and Travis Peak formations of the Lower Cretaceous Trinity Group. The Trinity Aquifer is divided into the Upper, Middle, and Lower Trinity units. The water-bearing units include, in descending order, the Glen Rose Limestone, Hensell Sand, Cow Creek Limestone, Sligo Limestone, and Hosston Sand (**Table 5**). The Glen Rose formation is divided informally into upper and lower members. Based on their hydrologic relationships, the water-bearing rocks of the Trinity Group collectively referred to as the Trinity Aquifer system, are organized into the following aquifer units:

Table 5. Water-Bearing Rocks of the Trinity Group

Aquifer	Formations
Upper Trinity	Upper Glen Rose Limestone
Middle Trinity	Lower Member of the Glen Rose Limestone, Hensell Sand, and Cow Creek Limestone
	Pine Island/Hammett Shale (confining bed)
Lower Trinity	Sligo Limestone and Hosston Sand

Because of fractures, faults, and other hydrogeological factors, the Upper, Middle, and Lower Trinity Aquifer units often are in hydraulic communication with one another and collectively should be considered a locally leaky-aquifer system (Plateau Water Planning Group, 2016). A map of the Trinity Aquifer relative to GMA-9 is shown in **Figure 5**.

A list of Trinity Aquifer technical references that are recommended for further reading are listed in **Chapter 7.0** - LIST OF REFERENCES (Additional References) of this ER.

2.3.1.2 Edwards Group of the Edwards-Trinity (Plateau) Aquifer

The Edwards Group of the Edwards-Trinity (Plateau) Aquifer consists of lower Cretaceous age saturated limestone and dolomite of the Edwards Group and underlying sediments of the Trinity Group. These strata are relatively flat lying, and located atop relatively impermeable pre-Cretaceous rocks. The upper Edwards portion of the aquifer system is generally more porous and permeable than the underlying Trinity, and where exposed at the land surface, the Edwards-Trinity (Glen Rose) interface gives rise to numerous springs that form the headwaters of several eastward and southerly flowing rivers (Plateau Water Planning Group, 2016). A map of the Edwards Group of the Edwards-Trinity (Plateau) Aquifer relative to GMA-9 is shown in **Figure 6**.

For clarity in this ER, GMA-9 has modified the nomenclature of the Edwards-Trinity (Plateau) Aquifer as defined by the TWDB, as the Edwards Group of the Edwards-Trinity (Plateau) Aquifer in order to limit the discussion to the formations that are part of the Edwards Group (Figure 7). The GMA-9 modified nomenclature is used throughout this ER, and consists of references for this aquifer as either the Edwards Group of the Edwards-Trinity (Plateau) Aquifer, the Edwards Group of Edwards-Trinity (Plateau) Aquifer, or the Edwards Group.

A list of Edwards Group of the Edwards-Trinity (Plateau) Aquifer technical references recommended for further reading are listed in **Chapter 7.0** - LIST OF REFERENCES (Additional References) of this ER.

2.3.1.3 Edwards Aquifer (Balcones Fault Zone)

The Edwards Aquifer (Balcones Fault Zone [BFZ]) consists of highly faulted, cavernous, highly transmissive Cretaceous-age limestone. The aquifer is present in twelve counties in central to south-central Texas, from Kinney County in the west to Bell County in the northeast. Groundwater from the Edwards Aquifer has been extensively produced for decades. Approximately half of the water produced from the Edwards Aquifer is used for irrigation, and half for municipal and industrial purposes (LBG-Guyton Associates, 2003).

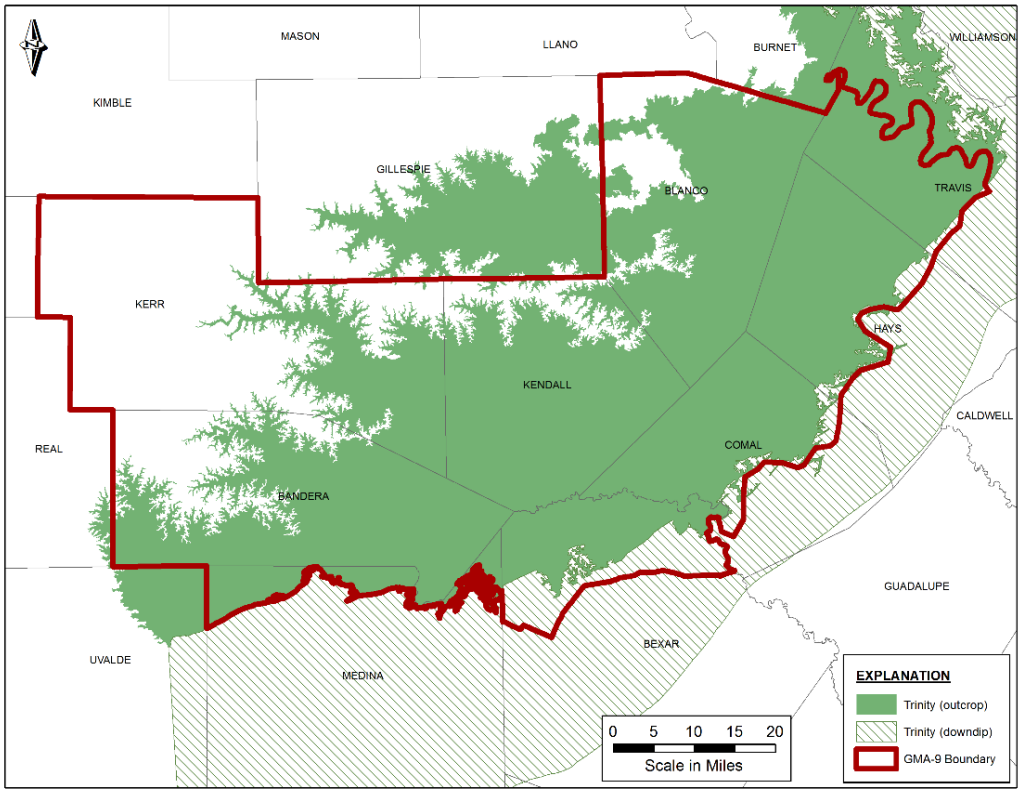

Figure 5. Trinity Aquifer within GMA-9 boundaries.

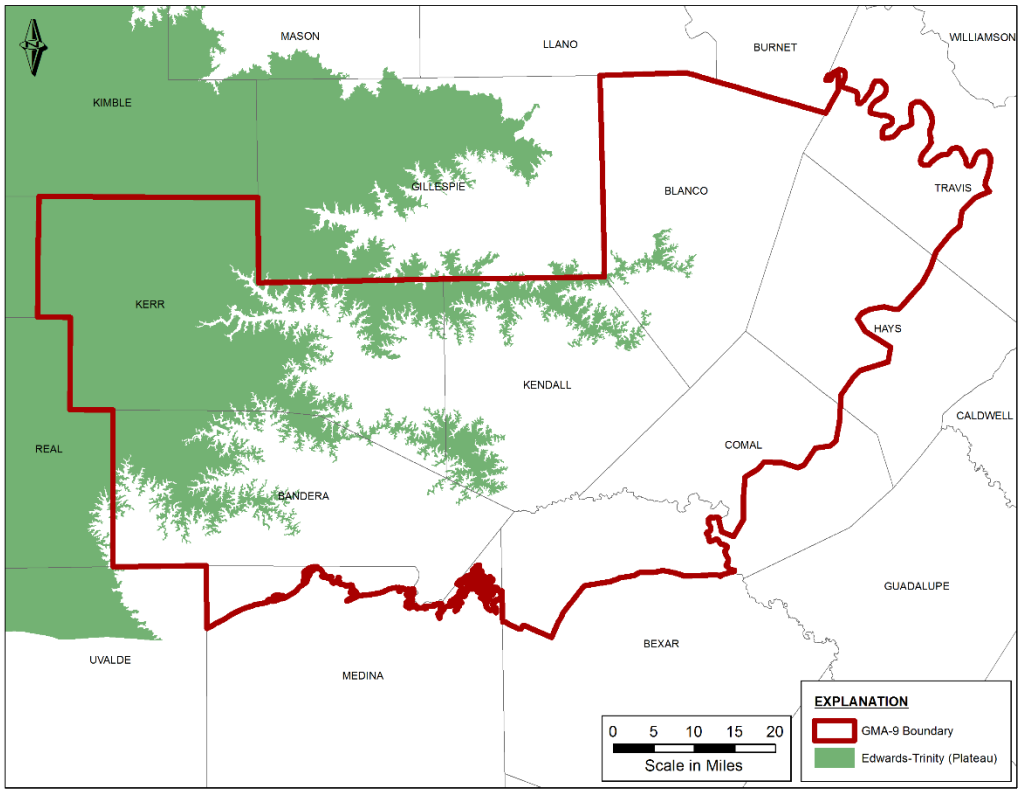

Figure 6. Edwards Group of the Edwards-Trinity (Plateau) Aquifer within GMA-9 boundaries.

Simplified Geological Column

Edwards-Trinity (Plateau) Aquifer

Regional Aquifer Name	Aquifer Name	Hydrologic Unit	Geologic Formation
Edwards - Trinity (Plateau) Aquifer	Edwards Group	Edwards Group	Edwards Limestone Comanche Peak LS Walnut Clay
	Trinity Aquifer	Upper Trinity	Upper Glen Rose Member of Glen Rose Fm
		Middle Trinity	Lower Glen Rose Member of Glen Rose Fm
			Hensell Sandstone Cow Creek Limestone
		Confining Zone	Hammett Shale
		Lower Trinity	Sligo Limestone Hosston/Sycamore Sandstone

Source: Ronald G. Fieseler, P.G.

Figure 7. Simplified Geological Column, Edwards-Trinity (Plateau) Aquifer.

The Edwards Aquifer is a typical karst aquifer, characterized by conduit flow that allows significant amounts of water to flow rapidly through the aquifer. Transmissivities in the Edwards Aquifer can be in the millions of gallons/foot/day, and porosities are typically between 5 and 15 percent. Wells drilled into the Edwards Aquifer can be some of the most productive wells in the world, with one well producing a reported 24,000 gallons per minute (gpm) from a flowing artesian well 30 inches in diameter (Ashworth and Hopkins, 1995). Because of the karstic nature of the Edwards Aquifer, it responds very quickly both to pumpage and to recharge. Water levels in wells and spring flows coming from the aquifer can change very rapidly in response to large changes in pumpage and especially from significant rainfall/recharge events. However, these characteristics are for the freshwater section of the aquifer, which may differ significantly from the saline section. Aquifer characteristics for the saline section of the Edwards Aquifer are poorly understood because this portion of the aquifer contains few completed wells (LBG-Guyton Associates, 2003). A map of the Edwards Aquifer (BFZ) and aquifer segments relative to GMA-9 is shown in **Figure 8**.

A list of Edwards Aquifer (BFZ) technical references recommended for further reading are listed in **Chapter 7.0** - LIST OF REFERENCES (Additional References) of this ER.

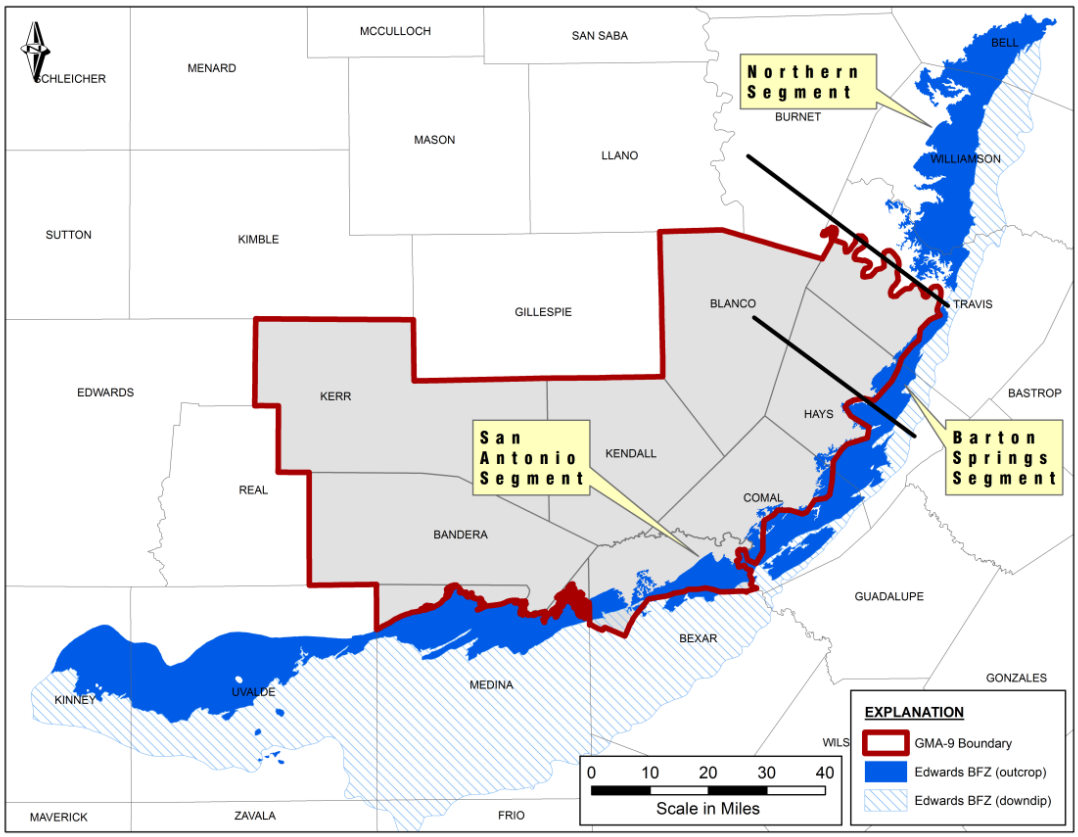

Figure 8. Edwards Aquifer (BFZ) within GMA-9 boundaries.

Minor Aquifers

2.3.2.1 Ellenburger-San Saba Aquifer

The Ellenburger-San Saba Aquifer is unconfined, a massive, thickly-bedded, complexly fractured and faulted mix of limestone and dolomite present in the north central portions of Blanco County. From the outcrop areas, the aquifer dips predominately southeastward into the subsurface at angles up to 10 degrees in some areas. It is either absent or deeply subsurface in a broad area extending from the central portion of the county toward the southern and eastern parts of the county. Well yields vary greatly depending on local geological conditions. Many Ellenburger-San Saba Aquifer wells are known for pumping rates between 3 to 45 gpm. In some areas though, significant localized development of subsurface solution features has occurred within the Ellenburger resulting in groundwater production capabilities greater than 200 gpm. Water quality in the Ellenburger is almost always very good, with the only concern being the low to moderate hardness. The Ellenburger-San Saba Aquifer is utilized extensively by the City of Johnson City and many domestic and livestock users in northern and northwestern Blanco County. Recharge to the Ellenburger is mainly through outcrops and porous areas in the beds of rivers and tributaries, with some cross-formational flow contributions from overlying members of other aquifers. There is no reported pumping from the Ellenburger-San Saba Aquifer in other counties located within GMA-9 (Blanco-Pedernales Groundwater Conservation District, 2013). A map of the Ellenburger-San Saba Aquifer relative to GMA-9 is shown in **Figure 9**.

A list of Ellenburger – San Saba Aquifer technical references recommended for further reading are listed in **Chapter 7.0** - LIST OF REFERENCES (Additional References) of this ER.

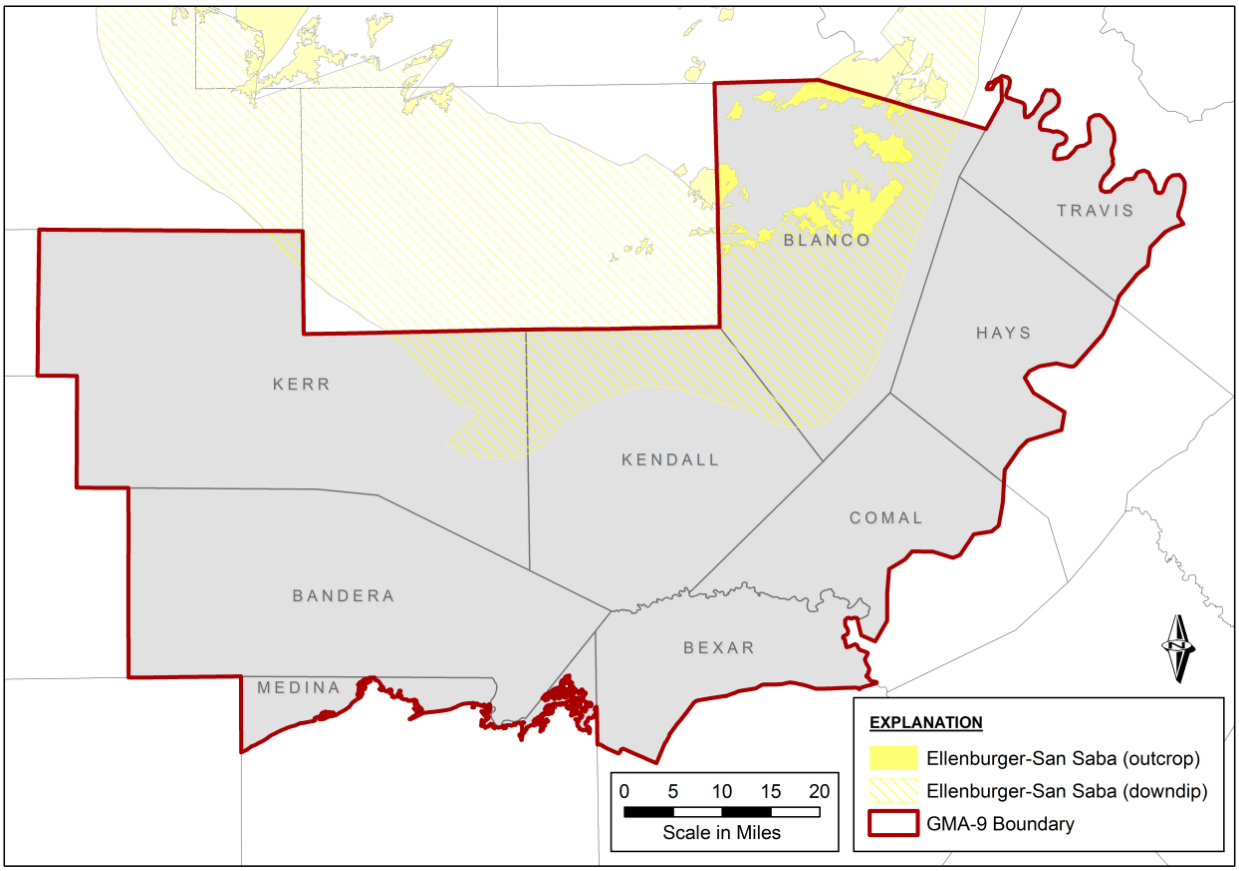

Figure 9. Ellenburger-San Saba Aquifer within GMA-9 boundaries.

Hickory Aquifer

The Hickory Aquifer is comprised of sandstone and outcrops in northwestern Blanco County. Exposures are highly irregular in shape, due to both faulting and the overlap of Cretaceous age rocks. This aquifer dips predominantly southeastward from the outcrop areas at angles of about 10 degrees in some areas. Well depths are highly dependent on local geology, with well depths varying between 100 feet (ft) deep to over 1,000 ft. The Hickory Aquifer yields low to moderate quantities of water and water quality is almost always very good. Well drillers have reported some wells capable of producing up to 50 gpm or more. Recharge to the Hickory occurs from local precipitation on its outcrop and through fractures and faults in overlying units and/or cross-formational flow where the Hickory is in the subsurface. There is no reported pumping from the Hickory Aquifer in other counties located within GMA-9 (Blanco-Pedernales Groundwater Conservation District, 2013). A map of the Hickory Aquifer relative to GMA-9 is shown in **Figure 10**.

A list of Hickory Aquifer technical references recommended for further reading are listed in **Chapter 7.0** - LIST OF REFERENCES (Additional References) in this ER.

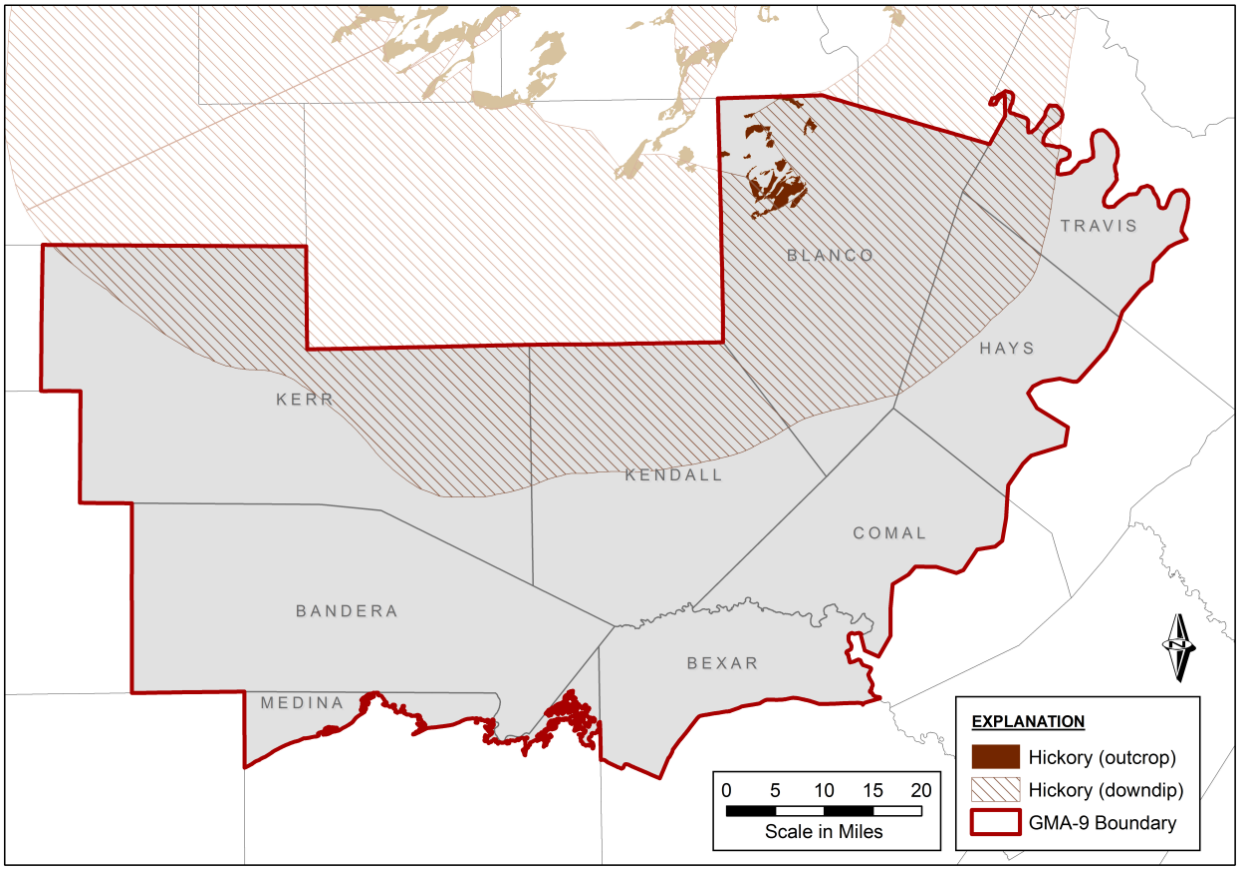

Figure 10. Hickory Aquifer within GMA-9 boundaries.

Marble Falls Aquifer

The Marble Falls Aquifer is an unconfined limestone aquifer located in the general vicinity of Pedernales Falls State Park and Cypress Mill. It is reported to be highly fractured with extensive development of subsurface solution features. This rather isolated and minor aquifer yields low to moderate quantities of water. Some wells in Blanco County have produced water with high nitrate concentrations. Due to its small surface extent, groundwater usage is limited to local domestic and livestock needs. No non-exempt wells producing from the Marble Falls Aquifer have been identified by the BPGCD as of August 2013 (Blanco-Pedernales Groundwater Conservation District, 2013). A map of the Marble Falls Aquifer relative to GMA-9 is shown in **Figure 11**.

A list of Marble Falls Aquifer technical references recommended for further reading are listed in **Chapter 7.0** - LIST OF REFERENCES (Additional References) in this ER.

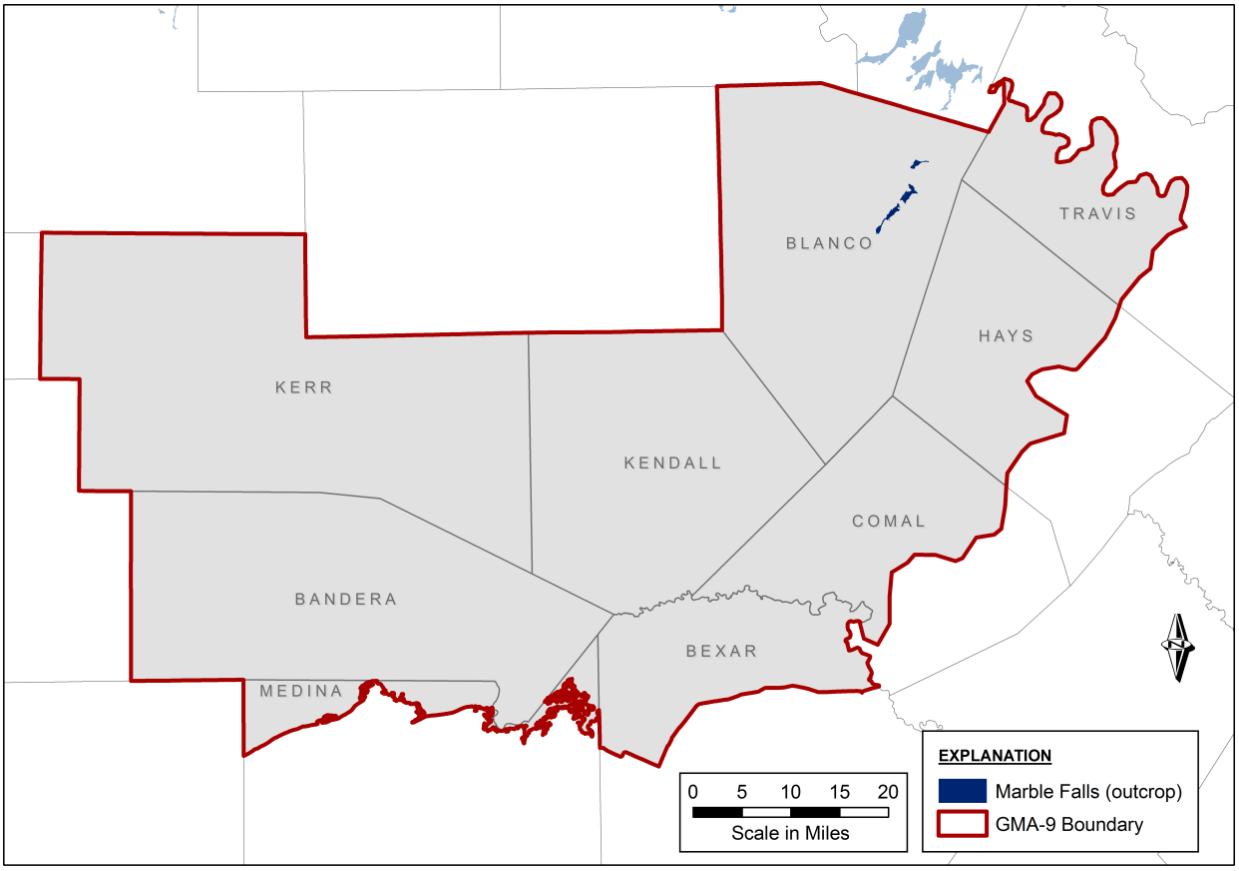

Figure 11. Marble Falls Aquifer within GMA-9 boundaries.

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3.0 STATUTORY AND REGULATORY REQUIREMENTS RELATED TO JOINT PLANNING AND DESIRED FUTURE CONDITIONS

This chapter of the ER will review the TWC's Chapter 36 requirements for joint planning, the DFCs and the MAGs, the TAC's Chapter 356 requirements for developing and submitting the DFCs and the ER to the TWDB, and GMA-9's observations regarding these statutory and regulatory provisions.

In terms of statutory requirements, Section 36.108 of the TWC sets out the requirements related to groundwater management joint planning. There are other provisions of Chapter 36 of the TWC that relate to implementation of the DFCs and the MAGs resulting from GMA joint planning efforts. The discussion in this ER, however, will focus on the Section 36.108 provisions, and briefly touch upon the other provisions as they also define the purpose and use of the DFCs and MAGs for GCDs after DFC adoption.

Title 31, TAC, Chapter 356, Subchapters C and D also set out the TWDB's rules related to groundwater management that impact the development and submittal of the DFCs and the ER. Other provisions of Chapter 356, and portions of Title 31, Chapter 357 of the TAC, address implementation of the DFCs and the resulting MAGs in the RWP context. The discussion in this ER will focus on the Chapter 356, Subchapter C and D provisions.

To initiate the second GMA-9 joint planning process, on February 23, 2015, the members of GMA-9 received a detailed presentation regarding the statutory and regulatory requirements related to joint planning (*"Desired Future Conditions and Explanatory Report" Presentation, Blanton & Associates and LBG-Guyton Associates, February 23, 2015*). A copy of this presentation is located in the GMA-9 files maintained in the BPGCD offices. Since that time, Section 36.108 of the TWC was amended by the Texas Legislature during the 84th Session in 2015 with the passage of H. B. Nos. 200 and 2767. The discussion below regarding Section 36.108 of the TWC includes those amendments.

3.1 Chapter 36, Texas Water Code

In general, Section 36.108 of the TWC requires GCDs to conduct joint planning and to develop and submit DFCs for the groundwater resources within their GMAs to the TWDB. While all of Section 36.108 pertains to joint planning within a GMA, certain subsections set out procedural and substantive requirements for developing and submitting DFCs and the ER (TWC §§36.108 (d) – (d-5)). There are also other provisions in Chapter 36 that relate to the DFCs and MAGs that result from joint planning and these provisions are also highlighted below. The following discussion summarizes the relevant sections and provisions related to the DFCs, the ER, and the MAGs.

The relevant subsections (to be discussed in more detail) set out requirements for: 1) periodic DFC review, proposal, and adoption; 2) considerations for establishing different DFCs for the same aquifer; 3) factors that GCDs must consider when proposing new DFCs; 4) the "balance" of DFCs between groundwater production and groundwater conservation; 5) GMA voting requirements related to proposed DFCs; 6) the public comment period on proposed DFCs and consideration of relevant public comments received; 7) consideration of information for final DFC adoption, and method of and voting on final DFCs; 8) preparing an ER and submitting both the DFCs and ER to the TWDB; 9) specific ER content; 10) GCD adoption of

the relevant DFCs and ER; 11) a deadline for GMA proposals for DFC adoption; 12) GMA meeting notices; 13) technical non-voting member and advisory committee participation; 14) appeals of the DFCs; 15) judicial appeals of the DFCs; 16) the MAGs; and 16) management plan goals and objectives related to the adopted DFCs.

Subsection 36.001 (30) of the TWC defines a DFC as follows: *"Desired future condition means a quantitative description, adopted in accordance with Section 36.108, of the desired condition of the groundwater resources in a management area at one or more specified future times,"* (TWC §36.001 (30), p. 5). GMAs throughout the State have used various characteristics to develop DFC statements for aquifers within their boundaries, such as water levels, saturated thickness, drawdown, spring flow, and artesian flow.

Subsection 36.108 (c) requires district representatives to meet at least annually to conduct joint planning with the other GCDs in the GMA, and to review their management plans, management area accomplishments, and proposals to adopt new or amend existing DFCs (TWC §36.108 (c)).

Subsection 36.108 (d) requires that no later than September 1, 2010, and every five years after that date, GCDs are to consider Groundwater Availability Models (GAMs) and other data or information for the GMA, and are to propose DFCs to be adopted for the relevant aquifers in the GMA. Before voting on proposed DFCs, GCDs are to consider the following factors:

(1) Aquifer uses or conditions within the GMA, including conditions that differ substantially from one geographic area to another;

(2) The water supply needs and water management strategies included in the state water plan;

(3) Hydrological conditions, including for each aquifer in the GMA the total estimated recoverable storage (TERS) as provided by the TWDB executive administrator (EA), and the average annual recharge, inflows, and discharge;

(4) Other environmental impacts, including impacts on spring flow and other interactions between groundwater and surface water;

(5) The impact on subsidence;

(6) Socioeconomic impacts reasonably expected to occur;

(7) The impact on the interests and rights in private property, including ownership and the rights of management area landowners and their lessees and assigns in groundwater as recognized under Section 36.002 (of the TWC);

(8) The feasibility of achieving the DFC; and

(9) Any other information relevant to the specific DFCs (TWC §36.108 (d)).

Subsection 36.108 (d-1) allows GCDs to establish different DFCs for each aquifer, aquifer subdivision, or geologic strata located partially or completely within the GMA, or for each geographic area over an aquifer or aquifer subdivision in the GMA, after considering and documenting the nine factors described in Subsection 36.108 (d) above and other relevant scientific and hydrogeological data (TWC §36.108 (d-1)).

Subsection 36.108 (d-2) requires that DFCs must provide a balance between *"the highest practical level of groundwater production and the conservation, preservation, protection, recharging, and prevention of waste of groundwater and control of subsidence in the management area,"* (TWC §36.108 (d-2), p. 50). This provision does not prohibit establishing DFCs consistent with management goals under Section 36.1071 (a) of the TWC related to management plans. Proposed DFCs must be approved by two-thirds of the GCD representatives. A 90-day public comment period begins on the day the proposed DFCs are mailed to the GCDs, and each GCD is to hold a public hearing on a DFC relevant to that particular GCD. During the public comment period, the GCDs are to make available a copy of the proposed DFCs and supporting materials, such as documentation of the nine factors considered under Subsection 36.108 (d) and GAM results. After the public hearings, the GCDs are to compile summaries of relevant comments received, any suggested DFC revisions, and the basis for those revisions, for consideration at the next GMA meeting (TWC §36.108 (d-2)).

Subsection 36.108 (d-3) of the TWC requires the GMA to meet again after either all GCDs submit their comment summaries or the 90-day public comment period expires, whichever happens first. At this meeting, the GMA is to consider all of the GCDs' comment reports and any GCDs' suggested revisions to the proposed DFCs, and finally adopt the DFCs for the GMA. The DFCs must be adopted by a resolution by two-thirds vote of all of the GCD representatives. This Subsection also requires GCD representatives to produce an ER for the GMA, and to submit that report, along with proof of the posted meeting notice and a copy of the resolution, to the TWDB and each GCD. The ER must:

(1) Identify each DFC;

(2) Provide the policy and technical justifications for each DFC;

(3) Include documentation that the factors under Subsection 36.108(d) were considered by the GCDs and a discussion of how the adopted DFCs impact each factor;

(4) List other DFC options considered, if any, and the reasons why those options were not adopted; and

(5) Discuss reasons why possible recommendations made by advisory committees and relevant public comments received by the GCD were or were not incorporated into the DFCs (TWC §36.108 (d-3)).

Subsection 36.108 (d-4) requires each GCD in the GMA to adopt the DFCs and ER that apply to that GCD (TWC §36.108 (d-4)).

Subsection 36.108 (d-5) states that, in spite of the requirements contained in Subsection 36.108 (d), a proposal for the adoption of a DFC for the relevant aquifers within a GMA is not required before May 1, 2016, regardless of the date on which a proposal was voted on before September 1, 2013. This provision expires on January 1, 2018 (TWC §36.108 (d-5)).

Subsection 36.1083 sets out the process, requirements, timeframe, assignment of hearing costs, and possible outcomes for an affected person to file a petition with the GCD to conduct a hearing before the State Office of Administrative Hearings (SOAH) appealing the reasonableness of an adopted DFC (TWC §36.1083).

Subsection 36.10835 sets out the process, requirements, timeframe, and possible outcomes for judicial appeal of a GCD's final order regarding the DFCs (TWC §36.10835).

Subsection 36.1084 states that the TWDB is to require GCDs in a GMA to submit the following information to the TWDB EA no later than 60 days after the DFCs are adopted by the GMA: 1) the DFCs adopted under Section 36.108 of the TWC; 2) proof that notice was posted for the GMA meeting; and 3) the DFC ER. This Subsection also requires the TWDB EA to provide each GCD and RWPG in the GMA with the MAGs based on the adopted DFCs (TWC §36.1084).

The definition of a MAG in Subsection 36.001 (25) of the TWC is *"the amount of water that the executive administrator determines may be produced on an average annual basis to achieve a desired future condition established under Section 36.108,"* (TWC §36.001 (25), p. 4).

Subsection 36.1085 requires each GCD in the GMA to ensure its management plan contains goals and objectives consistent with achieving the adopted DFCs for the applicable aquifers (TWC §36.1085).

Other provisions in Chapter 36 that apply to GCDs and their responsibilities as they relate to joint planning and the DFCs are Section 36.3011 – Commission Inquiry and Action Regarding District Duties, Section 36.1132 – Permits Based on Modeled Available Groundwater, and Section 36.456 – Desired Future Conditions (as they relate to aquifer storage and recovery [ASR] projects).

Section 36.3011 provides for an affected person to file a petition with Texas Commission on Environmental Quality (TCEQ) to request an inquiry regarding a GCD for nine reasons, five of which relate to a GCD's failure to: 1) participate in joint planning; 2) adopt the applicable DFCs adopted by the GMA; 3) update its management plan before the second anniversary of the GMA's adoption of the DFCs; 4) update its rules to implement the relevant DFCs before the first anniversary of the date it updated its management plan with the DFCs; and 5) adopt rules designed to achieve the DFCs adopted by the GMA. This Subsection also discusses TCEQ's process for reviewing these petitions and possible TCEQ action (TWC §36.3011).

Section 36.1132 states that GCDs are: 1) to issue permits, to the extent possible, up to the point that total exempt and permitted groundwater production achieves the DFC; and 2) to manage total groundwater production to achieve the DFC on a long-term basis, and consider five factors, one of which is the MAG, in issuing permits (TWC §36.1132).

Section 36.456 allows that a GCD may consider hydrogeologic conditions related to injecting and recovering groundwater as part of an ASR project in planning for and monitoring DFC achievement for the aquifer in which the project's wells are located (TWC §36.456).

3.2 Title 31, Texas Administrative Code, Chapter 356

Title 31, Chapter 356 of the TAC, sets out the TWDB's rules related to groundwater management. This Chapter includes rules related to the development and submittal of the DFCs and ER.

Rule §356.31 generally relates to the submission date for proposing DFCs for adoption (e.g., no later than five years after the date on which the GMA last adopted DFCs), and allows the GCDs in a GMA to propose

classifying a portion or portions of an aquifer as non-relevant if the GCDs determine that the aquifer characteristics, groundwater demands, and current groundwater uses do not warrant adoption of a DFC. For these aquifers proposed to be non-relevant, the GCDs must submit the following documentation to the TWDB for that portion of the aquifer to be classified as non-relevant:

(1) A description, location, and/or map of the aquifer or portion of the aquifer;

(2) A summary of aquifer characteristics, groundwater demands, and current groundwater uses, including the TERS as provided by the EA that support the conclusion that DFCs in adjacent or hydraulically connected relevant aquifer(s) will not be affected; and

(3) An explanation of why the aquifer or portion of the aquifer is non-relevant for joint planning purposes (31 TAC §356.31).

Rule §356.32 sets out the requirements for the DFC submission package to the TWDB, and states that GCDs must provide the following to the TWDB EA, no later than 60 days following the date on which the GCDs in the GMA collectively adopt the DFCs:

(1) A copy of the ER addressing the information required by Subsection 36.108 (d-3) and the criteria in Subsection 36.108 (d) of the TWC;

(2) A copy of the GMA resolution adopting the DFCs as required by Subsection 36.108 (d-3) of the TWC;

(3) A copy of the notice that was posted for the GMA meeting when the GCDs collectively adopted the DFCs as required by Subsections 36.108 (e) and 36.108 (e-2) of the TWC;

(4) The name of a designated GMA representative;

(5) Any GAM files or aquifer assessments acceptable to the EA used to develop the adopted DFCs with documentation sufficient to replicate the work; and

(6) Any other information the EA may need to estimate the MAG (31 TAC §356.32).

Rule §356.33 sets out the TWDB's responsibilities for determining the administrative completeness of the DFC submission package, Rule §356.34 discusses the TWDB requirements for GCD adoption of the DFCs, and Rule §356. 35 discusses the TWDB's responsibilities for generating the MAGs based upon the adopted DFCs (31 TAC §§356.33 – 356.35).

While Rules §§356.40 – 356.46 currently set out the TWDB's requirements, process, and timelines for appealing adopted DFCs, the TWDB is currently proposing to amend these rules in response to legislative action in 2015. As noted previously, H.B. No. 200 passed by the Texas Legislature in 2015, among other measures, changed the DFC appeals process to a formal legal proceeding before the SOAH with the TWDB staff serving as subject matter experts in these appeals processes, rather than the previous appeals process and hearing through the TWDB (31 TAC §§356.40 – 356.46).

Lastly, Rule §356.52 states that a GCD's management plan must contain, among other management goals, a goal to address the DFCs adopted pursuant to Section 36.108 of the TWC, and include various estimates,

including the MAG in the GCD as provided by the TWDB EA (31 TAC §356.52). Rule §356.56 also provides for amendments to management plans, including amendments related to newly developed DFCs and MAGs (31 TAC §356.56).

3.3 GMA-9 Observations – Statutory and Regulatory Requirements

The language in Section 36.108 does not require a specific format for the ER, and does not provide guidance on how specific the information to be addressed in the ER should be. The DFCs, as defined in the TWC, are long-term expressions or goal statements to be adopted by GMAs to state the desired condition(s) of an aquifer at some future point in time. GMAs across the State have chosen to express their desired future conditions, or long-term planning goals, in various ways (e.g., water levels, aquifer saturated thickness, draw down, spring flow, and artesian flow). The DFCs are a required and important planning element, and can be revisited and revised at least every five years, or sooner if necessary. This process is costly and time-consuming for GCDs, in particular those GCDs assigned to participate in multiple GMAs.

The MAGs are the TWDB's determination of the annual groundwater amount(s) that can be pumped from an aquifer on an average annual basis to achieve the DFC(s). As required by law, the MAGs are given to the RWPGs for their use in preparing the RWPs, and ultimately become a part of the SWP. These amounts are important to the State's water planning efforts as a required planning element. For planning purposes, the RWPGs cannot include a water management strategy in a RWP that exceeds the MAG. Water management strategies that are not included in the RWPs are not eligible to receive State permits or to secure State funding for these projects. As will be discussed later in this ER, the RWPGs acknowledge that groundwater permitting authority and decisions reside with the GCDs, and also acknowledge that the MAGs may change as the result of future GMA joint planning efforts. In this context, the MAGs may be viewed as "planning caps," but in no context are they to be viewed as "pumping caps." As was previously discussed, Section 36.1132 of the TWC instructs GCDs on issuing permits "*to the extent possible"* up to the point that total exempt and permitted use achieves the DFC, and to manage pumping to achieve the DFC on a long-term basis and consider the MAG along with four other factors in issuing permits.

It is also important to note that the change to the DFC appeals process will add time and potentially significant cost to the process of finalizing DFCs that are appealed. The new appeals process as defined in Subsection 36.1083 and Subsection 36.10835 of the TWC, if exercised as provided for by law, could delay the finalization of DFCs and MAGs for many months. These delays can only serve as an impediment to State, regional, and local efforts to effectively plan to meet future water supply needs.

The joint planning process as provided for in Chapter 36 of the TWC is an iterative process to plan for and manage the groundwater resources in Texas. The GCDs work with the DFCs, MAGs, and RWPGs as they continue their joint planning efforts and in their local efforts to manage the aquifers within their jurisdiction. In terms of joint planning, how the GCDs consider the nine new factors as part of the joint planning and DFC process can help to support the "reasonableness" of the adopted DFCs.

4.0 GMA-9 JOINT PLANNING AND DESIRED FUTURE CONDITION DEVELOPMENT PROCESS

Chapter 4.0 of this ER summarizes the process GMA-9 followed to develop and consider the proposed non-relevant aquifer classifications and the DFCs. During the first round of joint planning, GMA-9 undertook detailed consideration of DFCs and non-relevant aquifer classifications that were subsequently incorporated into the second round of planning. Therefore, a summary of the first round of DFC adoptions is included as part of this ER.

4.1 Second-Round of Joint Planning

The second round of joint planning began shortly after the TWDB issued MAG amounts in response to the original DFCs adopted by GMA-9. Those MAGs were issued on June 22, 2011 for the Ellenburger-San Saba, Hickory, and Marble Falls aquifers, on March 28, 2012 for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer, and on March 30, 2012 for the Trinity Aquifer.

GMA-9 immediately began second-round discussions in the fall of 2011, and continued a methodical and thoughtful approach to conducting joint planning. Two new significant issues, however, impacted these discussions in the second round: 1) the TWDB would no longer provide GMAs with groundwater availability modeling services and technical support; and 2) the new requirements in Chapter 36 of the TWC, including a more detailed process to consider and adopt DFCs and to prepare and submit an ER to support the GMA DFC decisions.

In summary, GMA-9 met 19 times throughout the GMA-9 area during the second joint planning cycle, and continued to obtain the assistance of a Technical Advisory Group and other ad hoc committees, convening outside of GMA-9 meetings, to complete their work. A list of GMA-9 meeting dates is listed below in **Table 6**.

Table 6. GMA-9 Joint Planning Meetings - Second-Round of Joint Planning

DATE	LOCATION
Monday, April 20, 2012	Bandera County River Authority and Groundwater District Bandera, Texas
Monday, June 11, 2012	Bandera County River Authority and Groundwater District Bandera, Texas
Monday, February 11, 2013	Boerne Convention and Community Center Boerne, Texas
Monday, April 8, 2013	Bandera County River Authority and Groundwater District Bandera, Texas
Monday, September 16, 2013	Bandera County River Authority and Groundwater District Bandera, Texas
Monday, November 18, 2013	Boerne Civic Center Boerne, Texas
Monday, April 14, 2014	Dripping Springs City Hall Dripping Springs, Texas
Monday, May 12, 2014	Boerne Convention and Community Center Boerne, Texas
Monday, July 14, 2014	Dripping Springs City Hall Dripping Springs, Texas

Table 6. GMA-9 Joint Planning Meetings - Second-Round of Joint Planning

DATE	LOCATION
Monday, August 4, 2014	Boerne Convention and Community Center Boerne, Texas
Monday, September 8, 2014	Upper Guadalupe River Authority Kerrville, Texas
Monday, December 15, 2014	Boerne Convention and Community Center Boerne, Texas
Monday, February 23, 2015	Upper Guadalupe River Authority Kerrville, Texas
Monday, April 27, 2015	Dripping Springs City Hall Dripping Springs, Texas
Monday, June 8, 2015	Bandera County River Authority and Groundwater District Bandera, Texas
Monday, September 28, 2015	Dripping Springs City Hall Dripping Springs, Texas
Monday, October 13, 2015	Bandera County River Authority and Groundwater District Bandera, Texas
Monday, April 4, 2016	Bandera County River Authority and Groundwater District Bandera, Texas
Monday, April 18, 2016	Dripping Springs City Hall Dripping Springs, Texas

Copies of all meeting notices and minutes are located in the GMA-9 files maintained at the BPGCD offices. All meetings were open to the public, and the public was offered an opportunity to provide input at many of these meetings. Each meeting agenda also included reports by TWDB staff and RWPG representatives on activities for Regions J, K, and L, to ensure communication and coordination between these entities and GMA-9 throughout this process. Lastly, GMA-9 also extended offers to the county commissioner's courts for those two areas in GMA-9 without GCDs to appoint non-voting members to serve on GMA-9. Highlights of GMA-9 activities and discussions during this second round of joint planning are summarized below.

In the early phases of the second round, GMA-9 prepared responses to two petitions challenging the reasonableness of the DFCs that GMA-9 adopted for the Edwards Group of the Edwards-Trinity (Plateau) and Trinity aquifers. These petitions will be discussed in more detail later in this ER. The TWDB ultimately issued MAG amounts for these GMA-9 DFCs in March 2012.

From the outset of the planning cycle, GMA-9 discussions focused on developing cooperative methods, strategies, organization, and funding to successfully complete this process, given the significant changes in the TWC and at the TWDB, for this and future planning cycles.

GMA-9 also discussed Committee review of individual GCD GMPs including how the GCDs were achieving applicable the DFCs, monitoring strategies, and methodologies for complying with the DFCs and appointing a committee to review various proposals to accomplish this task, and agreeing on a methodology and annual schedule for individual GCD and GMA-9 review of GMPs as required by Chapter 36 of the TWC.

GMA-9 spent a great deal of time during this planning cycle considering whether the Ellenburger, Hickory, and Marble Falls aquifers should be declared non-relevant for joint planning purposes within GMA-9. After much discussion and consideration, in recognition of two GMA-9 GCDs' local priorities and in an effort to strike a balance in the management area, GMA-9 voted to declare the Ellenburger-San Saba and Hickory aquifers as relevant in Kendall County only (in GMA-9), and to declare the Ellenburger-San Saba, Hickory and Marble Falls aquifers as non-relevant for the purposes of joint planning in all other parts of GMA-9. These local GCD positions are summarized in a May 24, 2013 report prepared by Ronald G. Fieseler, P.G., General Manager of the BPGCD, and Tommy Matthews, P.G., REM, Board President, CCGCD (Fieseler and Mathews, 2013). These considerations by GMA-9 will also be discussed later in this ER.

In conjunction with discussions related to the Ellenburger, Hickory, and Marble Falls aquifers, GMA-9 discussed establishing separate DFCs for the Middle Trinity and Lower Trinity aquifers. GMA-9 previously discussed this DFC proposal during the first planning cycle. Second planning cycle discussion included: 1) how much time it might take to analyze these proposals; 2) how the DFCs would be divided locally and regionally; 3) how these DFCs might require new monitoring strategies; and 4) how the new DFCs might affect local GCDs' rules and local groundwater management plans. There were also concerns expressed about whether the current model, the Hill Country Trinity Model (HCT GAM), was capable of accurately defining MAG amounts for these two aquifers. GMA-9 would keep this item as on-going and would continue discussions. GMA-9 also considered whether to declare the Upper Trinity as non-relevant for the purposes of joint planning, and decided by consensus to leave the Upper Glen Rose Aquifer (Upper Trinity) classified as relevant throughout GMA-9.

Early in the second planning cycle, GMA-9 members voted to conduct a voluntary study to compare actual groundwater level data with groundwater model predictions, on a well-by-well basis, for the Trinity Aquifer to refine how the model results related to actual water level data, and how these two data sets could be considered and evaluated in future joint planning efforts. This study was completed in February 2014 with the publication of the final report titled *A Comparison of Groundwater Monitoring Data with Groundwater Model Results Groundwater Management Area 9*. In summary, the report provided insights into the use of the GAM versus actual well data to advance future planning efforts (Hutchison and Beach, 2014).

GMA-9 also received technical presentations, such as a presentation on the TWDB's TERS amounts for the aquifers in GMA-9, the EAA's *Edwards Aquifer-Trinity Aquifer Inter-Formational Flow Study*, the CCGCD's inter-relationship between spring flow and groundwater levels study, and the BSEACD's hydrogeological studies and atlas updates in eastern GMA-9.

GCD members ultimately agreed to participate in a cost sharing arrangement to retain a consultant to prepare any reports or submissions required by Chapter 36 of the TWC and the TWDB in this round of DFC adoptions, and issued a request for qualifications to prepare an ER and other submissions that might be required in this round of joint planning. The team of Blanton & Associates, Inc. and LBG-Guyton Associates was selected to perform this work on behalf of GMA-9. The CCGCD agreed to serve as the contracting district, and costs were split evenly between the GCDs. During discussion related to developing the scope of work for the contract, GMA-9 members discussed using the existing DFCs as the best starting point for planning purposes. GMA-9 formed a subcommittee, the Explanatory Report Liaison

Subcommittee (ERLS), to work with the team of Blanton and LBG-Guyton on the project. To initiate the ER project, the ERLS and the team of Blanton and LBG-Guyton met with TWDB representatives on January 12, 2015 to review the TWC and TAC requirements, TWDB checklists, and proposed project schedule and report outline.

As previously mentioned, GMA-9 received a presentation on the statutory and regulatory requirements related to the second round of joint planning in February 2015. For the early stages of ER preparation, GMA-9 discussions included maintaining the same DFCs for the Trinity and Edwards Group of the Edwards-Trinity (Plateau) aquifers that were adopted in the first round of planning. The rationale also expressed for this proposal consisted of: 1) these DFCs were long-term targets; 2) the GCDs had only just begun to assess the water level changes during the first five years of implementing the current DFCs; 3) drought conditions prevailed for most of the five-year period since the DFCs were adopted; and 4) the GCDs believed it would be more effective to assess the DFCs over a longer time period.

GMA-9 also developed a process and form for use during the time period before the required 90-day public comment period as stated in Subsection 36.108 (d-2) of the TWC, and for use during the required 90-day public comment. The public comment process for the period before the required public comment period and the form developed by GMA-9 to assist the public in submitting comments to GMA-9 during that time were approved by GMA-9 on April 27, 2015. A copy of the meeting notices, minutes, and public comment form are located in the GMA-9 files maintained at the BPGCD offices.

On April 27, 2015, GMA-9 also authorized the following DFCs and proposed non-relevant aquifer classifications for the purposes of preliminary ER analysis only (**Table 7**):

Table 7. GMA-9 Major and Minor Aquifers and Authorized Desired Future Conditions and Non-Relevant Designations for Preliminary ER Analysis Purposes

MAJOR OR MINOR AQUIFER	POSSIBLE AUTHORIZED DESIRED FUTURE CONDITION OR NON-RELEVANT AQUIFER DESIGNATION FOR PRELIMINARY ER ANALYSIS PURPOSES (Authorized by GMA-9 on April 27, 2015)
Edwards Aquifer (Balcones Fault Zone)	Non-Relevant Aquifer Designation (throughout GMA-9)
Edwards Group of Edwards-Trinity (Plateau)	Allow for no net increase in average drawdown in Bandera and Kendall counties
	Non-Relevant Aquifer Designation (throughout GMA-9 except for Bandera and Kendall counties)
Ellenburger-San Saba	Allow for an increase in average drawdown of no more than 2 Feet in Kendall County
	Non-Relevant Aquifer Designation (throughout GMA-9 except for Kendall County)
Hickory	Allow for an increase in average drawdown of no more than 7 Feet in Kendall County
	Non-Relevant Aquifer Designation (throughout GMA-9 except for Kendall County)
Marble Falls	Not Applicable (see discussion below)
	Non-Relevant Aquifer Designation (throughout GMA-9)
Trinity	Allow for an increase in average drawdown of approximately 30 Feet through 2060 (throughout GMA-9)

Below is a summary of the relevant public comments received by GMA-9 regarding the proposed non-relevant aquifer classifications and/or DFCs before the required 90-day public comment period began (**Table 8**).

Table 8. Relevant Public Comment(s) Received by GMA-9 ***Prior** to* Required 90-Day Public Comment Period

Date of Public Comment	Name of Person Submitting Comment(s)
June 18, 2015	K. Holland

Throughout this planning cycle, coordination with TWDB staff was integral. GMA-9 or its representatives requested and received clarification and assistance with a variety of questions related to this process, and TWDB consideration of the DFCs and DFC statements, proposed non-relevant aquifer classifications, GAM issues, and development of the GMA-9 ER. GMA-9 also met on June 8, 2015 to discuss the RWP process and potential impacts on the DFCs and resulting MAGs.

On September 28, 2015, GMA-9 received a comprehensive presentation from Blanton and LBG providing them with an overview of the GMA-9 DFC development process, GMA-9's proposed non-relevant aquifer classifications, possible proposed GMA-9 DFCs including policy and technical justifications for each DFC, and consideration of the nine factors identified in Subsection 36.108 (d) of the TWC. GMA-9 members were given the opportunity to discuss the nine factors and to consider them in the context of joint planning and the proposed DFCs. A sample copy of the posted meeting notice, and the meeting minutes are located in **Appendix A** of this ER. A copy of the presentation is located in the GMA-9 files maintained at the BPGCD offices.

After discussing and considering all of the information presented, including the nine factors listed in Subsection 36.108 (d) of the TWC, GMA-9 members voted to propose the following aquifers or portions of aquifers be classified as non-relevant for joint planning purposes only in all or portions of the following specified GMA-9 counties (**Table 9**):

Table 9. Adopted Proposed Non-Relevant Aquifer Classifications and Applicable Areas within GMA-9 (Approved by GMA-9 on September 28, 2015)

PROPOSED NON-RELEVANT AQUIFER CLASSIFICATION	APPLICABLE AREAS WITHIN GMA-9 (ALL OR PORTIONS OF THE FOLLOWING COUNTIES, AS APPLICABLE)
Edwards Aquifer (Balcones Fault Zone)	Bexar, Comal, Hays, and Travis Counties
Edwards Group of Edwards-Trinity (Plateau)	Blanco and Kerr Counties
Ellenburger-San Saba	Blanco and Kerr Counties
Hickory	Blanco, Hays, Kerr, and Travis Counties
Marble Falls	Blanco County

In addition, GMA-9 members voted to adopt the following as proposed DFCs (**Table 10**):

Table 10. Adopted As Proposed DFCs for GMA-9 Major or Minor Aquifers and Applicable Areas within GMA-9 (Approved by GMA-9 on September 28, 2015)

MAJOR OR MINOR AQUIFER	DESIRED FUTURE CONDITION
Trinity	Allow For An Increase in Average Drawdown of Approximately 30 Feet Through 2060 (throughout GMA-9) Consistent With "Scenario 6" in TWDB GAM Task 10-005
Edwards Group of Edwards-Trinity (Plateau)	Allow For No Net Increase in Average Drawdown in Bandera and Kendall Counties Through 2070
Ellenburger-San Saba	Allow For An Increase in Average Drawdown of No More Than 2 Feet in Kendall County Through 2070
Hickory	Allow For An Increase in Average Drawdown of No More Than 7 Feet in Kendall County Through 2070

Subsequent to these actions by GMA-9, GMA-9 Chairman Ron Fieseler sent a letter to all ten of the GMA-9 GCDs on September 30, 2015 informing them of GMA-9's actions, the 90-day public comment period to extend from Thursday, October 1, 2015 through Thursday, December 31, 2015 (a total of 92 days) regarding these GMA-9 proposals, and the need to hold a GCD public hearing on these proposals relevant to each particular GCD. A copy of Chairman Fieseler's letter to the GCDs is located in the GMA-9 files maintained at the BPGCD offices.

In addition, the GMA-9 GCDs made a public comment form available to assist the public in submitting comments to the GCDs during this time period. A copy of that form can also be found in the GMA-9 files maintained at the BPGCD offices.

GMA-9 met again on Monday, October 13, 2015, for additional discussion and consideration of the issues submitted by some of the GMA-9 GCDs on the ninth factor enumerated in Section 36.108 (d) of the TWC. Because they had considered the ninth factor at the previous meeting on September 28th and opted to have more discussion on October 13th, GMA-9 voted to take an action re-validating all discussions, actions, and votes taken at their September 28, 2015 meeting, including any additional discussion and action taken on the ninth factor as a result of the meeting on October 13th. GMA-9 members also discussed notice requirements and process considerations for holding the required public hearings, and received a presentation from the BSEACD on DFC monitoring considerations. As a result of the DFC monitoring discussion, Chairman Fieseler appointed a Technical Advisory Group to meet and develop an approach for this type of assessment. A sample copy of the posted meeting notice, and the meeting minutes for the October 13th GMA-9 meeting are included in **Appendix A** of this ER.

Table 11 provides a summary of GCD public hearing dates, relevant public comments received by either a GMA-9 GCD or GMA-9 regarding the proposed non-relevant aquifer classifications and DFCs either during the required 90-day public comment period, or during a GCD public hearing held during the public comment period. Only the CTGCD, HTGCD and GMA-9 received written comments during the 90-day public comment period. The BCRAGD, BSEACD, CCGCD, CTGCD, HTGCD, and TGRGCD received verbal public comments at their GCD public hearings.

Table 11. Relevant Public Comments Received By Either GMA-9 GCDs or GMA-9 ***During*** Required 90-Day Public Comment Period (October 1, 2015 Through December 31, 2015)

GCD or GMA-9	Proposed Non-Relevant Aquifer Classification and DFC Public Hearing Date	Public Comments Received During 90-Day Public Comment Period	Public Comments Received at GCD Public Hearing
BCRAGD	November 5, 2015	None	Yes – H. Bussey
BPGCD	November 19, 2015	None	None
BSEACD	November 19, 2015	None	Yes – B. Bunch/Save Our Springs
CTGCD	December 21, 2015	Yes – J. Madden	Yes – R. Maurer
CCGCD	November 9, 2015	None	Yes – T. Pfeiffer
EAA	December 8, 2015	None	None
HTGCD	November 18, 2015	Yes (8) - M. Heinemann, P. Jones, S. Buse, S. Langenkamp, R. Barker, R. Shoemaker and J. Beal, Wimberley Valley Watershed Association, and R. Slade	Yes – R. Shoemaker-Beal and J. McMeans
HGCD	December 9, 2015	None	None
MCGCD	November 18, 2015	None	None
TGRGCD	November 12, 2015	None	Yes – B. Fenstermaker
GMA-9	N/A	Yes (4) – Flying L Ranch, Wimberley Valley Watershed Association, Hill Country Alliance, et. al, and R. Barker	N/A

In addition to public hearings noted above, the BCRAGD and the MCGCD each held one additional hearing regarding GMA-9's proposed non-relevant aquifer classifications and DFCs because of technicalities related to their original public hearing notice postings. The BCRAGD posted notice of a second public hearing and held this hearing on February 26, 2016. The MCGCD also posted notice of a second hearing and held their hearing on February 17, 2016.

Table 12 summarizes the relevant public comments received by either the BCRAGD or the MCGCD regarding the proposed non-relevant aquifer classifications and DFCs at their second public hearings. Neither GCD received public comments at these hearings.

Table 12. Relevant Public Comments Received By Either BCRAGD or MCGCD at Second Public Hearing

GCD or GMA-9	Second Proposed NRAC AND DFC Public Hearing Date	Public Comments Received at Public Hearing
BCRAGD	February 26, 2016	None
MCGCD	February 17, 2016	None

With regard to written public comments received by either the CTGCD, HTGCD or GMA-9 during the 90-day public comment period, some of this input was provided in the form of a question rather than a comment on a specific DFC. Other input provided to either a GCD or GMA-9 was related to DFCs in general or an alternative DFC for either the proposed Trinity or Edwards Group of the Edwards-Trinity (Plateau) aquifer DFCs.

GMA-9 Chairman Ron Fieseler prepared a summary of these questions and comments (both oral and written), for GMA-9 consideration (**Appendix B**). This summary includes either a response by GMA-9 to the question, or a GMA-9 response to the comment that explains why it was or was not incorporated into the DFCs. The questions and/or comments were consolidated into similar comment groupings to allow for a more efficient review of the public comments. The members of the GMA-9 ERLS met on two occasions in March 2016 to discuss and review the public comments and draft responses prior to presenting the summary to GMA-9 for review and consideration.

In addition, as required by Subsection 36.108 (d-3) of the TWC, each GMA-9 GCD prepared a summary of the relevant public comments they received during the public hearings, and submitted those summaries to GMA-9. As a result of this public comment process and the public hearings held by the GCDs, no GCD boards of directors voted to recommend changes to either the proposed non-relevant aquifer classifications or DFCs.

Copies of all GCD public hearing notices, public comments they received, and GCD public comment summaries are located in the files of that particular GCD. Copies of written public comments submitted directly to GMA-9 are located in the GMA-9 files maintained in the BPGCD offices.

GMA-9 met on April 4, 2016 and April 18, 2016, to review and consider the relevant public comments received during the GCD public hearings provided in the GCD summaries, and to review and consider a summary of oral and written comments and/or questions received by either the GCDs or GMA-9, and GMA-9 responses.

On April 18, 2016, after considering all of the information presented, and further discussion regarding the proposed non-relevant aquifer classifications and DFCs, GMA-9 members voted to: 1) approve the *Summarization of Public Comments Received and GMA-9 Responses*; 2) adopt GMA-9 Resolution No. 041816-1 – Adopting the Groundwater Management Area 9 Joint Planning Committee's (GMA-9) Classifications of Non-Relevant Aquifers for Joint Planning Purposes and Desired Future Conditions for Relevant Aquifers in GMA-9; and 3) approve the *Groundwater Management Area 9 Explanatory Report for Desired Future Conditions for Major and Minor Aquifers*.

A sample copy of the posted meeting notice for the April 18, 2016 meeting, and GMA-9 Resolution No. 041816-1 adopted on April 18, 2016, are included in **Appendix A** of this ER.

4.2 First-Round of Joint Planning

During the first round of joint planning, GMA-9 undertook detailed consideration of DFCs and non-relevant aquifer classifications that subsequently supported the second round of planning. Therefore, a summary of the first round of DFC adoptions is included as part of this ER.

GMA-9 used a methodical process during the first round of joint planning to engage and obtain public and stakeholder input. GMA-9 first met on September 20, 2005 in response to the passage of H.B. No. 1763 that amended Chapter 36 of the TWC to require GCD joint planning. Following this initial meeting, GMA-9 met numerous times each year, and also established a Technical Advisory Group that met several times.

All of these meetings were open to the public who were offered an opportunity to provide input at many of these meetings. During these meetings, GMA-9 considered a wide variety of issues and viewpoints. GMA-9 also cooperated with a University of Texas graduate student class that, over a period of approximately one year, conducted stakeholder interviews and prepared a report titled *What do Groundwater Users Want? Desired Future Conditions for Groundwater in the Texas Hill Country* (University of Texas at Austin, LBJ School of Public Affairs, 2008). This report covered topics such as resource management policy, water use demands, population growth, and potential impacts within GMA-9. The report concluded that public awareness of groundwater planning was critical and that sharing information among the GCDs, TWDB, and other governmental entities would require greater communication. The report also noted that the GCDs within GMA-9 meet regularly and communicate across political and geographic boundaries, and that these GMA-9 meetings are open to the public. All interviewed stakeholders concurred that population growth and withdrawals of groundwater will continue to increase for the foreseeable future within GMA-9, and that DFCs are likely to reflect projected population growth and potential groundwater use, including exempt wells. A subsequent Ph.D. dissertation titled *Finding a Reasonable Aquifer Yield: Decision Support Methods For Groundwater Policy Development In Texas* affirmed the results of the 2008 study (Petrossian, 2013). In addition, six public meetings were held to receive stakeholder input on the DFC process, and public hearings were held prior to GMA-9 taking action to adopt the DFCs.

The most prevalent stakeholder comments GMA-9 members received addressed the desire and need to manage aquifers in such a way as to "protect spring flow and base flow to creeks and rivers" and that GMA-9 "did not allow mining of the aquifers" (GMA-9, 2010). These sentiments were expressed by a diverse group of stakeholders, including landowners, state and local government representatives, environmental organizations, recreational interests, local businesses, and wildlife organizations. Another concern heard most often by GMA-9 was "do not rush into setting a DFC, give due consideration to all aspects of the aquifer system, and do what is best to provide for sustainable water for those who rely on groundwater from GMA-9" (GMA-9, 2010). During the course of developing and evaluating possible DFCs and through public involvement, the members of GMA-9 gave due consideration to all of this input.

Throughout the entire process, the members of GMA-9 were committed to completing this process as required by Chapter 36 of the TWC and worked together cooperatively to accomplish this effort. As GMA-9 moved forward, the Committee considered potential impacts of various DFC scenarios on the following:

- Water supply to meet current demands and future development;
- Demographic trends;
- RWPs for Regions J, K, and L;
- Environmental needs;
- Permitted and exempt uses;
- Geologic conditions;
- Hydrologic characteristics;
- Balancing demands and conservation;

- Socioeconomic issues; and
- Drought.

In addition to the various issues discussed above, GMA-9 requested and the TWDB prepared numerous technical reports to analyze various DFC scenarios, some of which consisted of hundreds of individual GAM simulations, to provide thorough technical analyses of the issues. **Table 13** is a listing of all TWDB GAM Runs, Tasks, or Aquifer Assessments performed specifically for GMA-9. These documents are available on the TWDB website or in the GMA-9 files maintained at the BPGCD offices.

Table 13. TWDB GMA-9 GAM Runs, Tasks, or Aquifer Assessments

GAM RUN, TASK or AQUIFER ASSESSMENT	DATE (in date order)	AQUIFER	ISSUES CONSIDERED
GAM Run 03-02	March 21, 2003	Trinity	Average well yield in Kendall County
GAM Runs 02-01,-02	March 21, 2003	Trinity	Steady-state water budget in GAM
GAM Run 03-12	July 18, 2003	Trinity	Water budget, storage, and drawdown
GAM Run 03-25	September 2, 2003	Trinity	Recharge, leakage and total storage for Bandera County
GAM Run 04-18	October 7, 2004	Trinity	Recharge rate in Hays Trinity GCD
GAM Run 05-35	September 12, 2005	Trinity	Impact of pumping on Guadalupe River
GAM Run 07-03	June 13, 2007	Edwards Group of Edwards-Trinity (Plateau)	Impacts from historic and specified baseline pumping
GAM Run 7-18	July 13, 2007	Trinity	Spring flow discharge, 2002 SWP pumping
GAM Run 7-23	August 31, 2007	Trinity	90% spring flow maintenance under drought of record (DOR)
GAM Run 08-15 (unpublished report)	July 8, 2008	Trinity	35ft drawdown, revised pumpage in Hays and Travis counties
		Edwards Group of Edwards-Trinity (Plateau)	Zero drawdown in Edwards Group of Edwards-Trinity (Plateau) Aquifer
GAM Run 08-20	July 28, 2008	Trinity	15 ft drawdown, revised pumpage in Hays and Travis counties
		Edwards Group of Edwards-Trinity (Plateau)	Zero drawdown in Edwards Group of Edwards-Trinity (Plateau) Aquifer
GAM Run 08-30	August 19, 2008	Trinity	• 35 ft drawdown in Blanco, Bandera, Kerr, and Kendall counties • 15 ft drawdown in Comal, Hays, and Travis counties • 55 ft drawdown in Bexar and Medina counties
		Edwards Group of Edwards-Trinity (Plateau)	Zero drawdown in Edwards Group of Edwards-Trinity (Plateau) Aquifer

Table 13. TWDB GMA-9 GAM Runs, Tasks, or Aquifer Assessments

GAM RUN, TASK or AQUIFER ASSESSMENT	DATE (in date order)	AQUIFER	ISSUES CONSIDERED
GAM Run 08-70	December 2, 2008 (Draft)	Trinity	Increase baseline pumping by (A) 25% and (B) 50% from GAM runs 08-15 and 08-20 • No pumping increase in Edwards or Upper Trinity • Also run the steady-state simulation with no pumping
		Edwards Group of Edwards-Trinity (Plateau)	Zero drawdown in Edwards Group of Edwards-Trinity (Plateau) Aquifer
GTA Aquifer Assessment 08-90mag	March 6, 2009	Edwards Group of Edwards-Trinity (Plateau)	Managed Available Groundwater amounts (by county): • Bandera = 683 acre-feet (ac-ft)/year • Kendall = 318 ac-ft/year • Kerr = 1,263 ac-ft/year
GTA Aquifer Assessment 08-09mag	October 1, 2009	Ellenburger-San Saba	Managed Available Groundwater amounts (by county): • Blanco = 2,661 ac-ft/year • Kendall = 9 ac-ft/year • Kerr = 6 ac-ft/year
GTA Aquifer Assessment 08-10mag	October 1, 2009	Hickory	Managed Available Groundwater amounts (by county): • Blanco = 1,163 ac-ft/year • Travis = 1 acre-foot (ac-ft)/year • Hays = 1 ac-ft/year • Kendall = 2 ac-ft/year • Kerr = 4 ac-ft/year
GTA Aquifer Assessment 08-11mag	October 2, 2009	Marble Falls	Managed Available Groundwater amounts (by county): • Blanco = 261 ac-ft/year
GAM Runs 09-011, 09-012 and 09-24	September 14, 2010	Trinity	• 46 years average recharge and 1.5x 2008 pumping + 7 year DOR and 2008 pumping • 46 years average recharge and 1.5x 2008 pumping + 7 year average recharge and 2008 pumping • 46 years average recharge and 1.5x 2008 pumping + 7 year average recharge and 1.5x 2008 pumping • Pumping that would result in up to 45 ft drawdown in Lower Trinity
GAM Runs 09-011, 09-012 and 09-24, Supplement	September 3, 2010	Trinity	DOR assessment based on precipitation estimates from tree-ring study

Table 13. TWDB GMA-9 GAM Runs, Tasks, or Aquifer Assessments

GAM RUN, TASK or AQUIFER ASSESSMENT	DATE (in date order)	AQUIFER	ISSUES CONSIDERED
GAM Task 10-005	September 3, 2010	Trinity	Seven pumping scenarios with pumping ranging from zero to 2x 2008 pumping via 387 50-year simulations incorporating precipitation estimates tree-ring study
GAM Task 10-031: Supplement to GAM Task 10-005	January 25, 2011	Trinity	Additional results and water level contour maps related to four of the seven pumping scenarios (ranging from 2008 pumping, to 2x 2008 pumping) analyzed in GAM Task 10-005 for the Trinity Aquifer
GTA Aquifer Assessment 10-01 MAG	June 22, 2011	Ellenburger-San Saba	MAG amounts (by county) from TWDB for Ellenburger-San Saba Aquifer by GMA-9 County
GTA Aquifer Assessment 10-02 MAG	June 22, 2011	Hickory	MAG amounts (by county) from TWDB for Hickory Aquifer by GMA-9 County
GTA Aquifer Assessment 10-14 MAG	June 22, 2011	Marble Falls	MAG amounts (by county) from TWDB for Marble Falls Aquifer by GMA-9 County
GAM Run 10-049 MAG, Version 2	March 28, 2012	Edwards Group of Edwards-Trinity (Plateau)	MAG amounts (by county) from TWDB Edwards Group of Edwards-Trinity (Plateau) Aquifer by GMA-9 County
GAM Run 10-050 MAG, Version 2	March 30, 2012	Trinity	MAG amounts (by county) from TWDB for Trinity Aquifer by GMA-9 County

Sources: TWDB and GMA-9

In addition, GMA-9 conducted other technical analysis through the LBJ School of Public Affairs research project previously discussed.

To help ensure that the best available information was used, the members of GMA-9 developed and updated pumping and usage estimates for each GCD within the GMA before adopting the DFCs, and used sound scientific principles to help guide their evaluations and decisions.

GMA-9 ultimately reached its consensus-based decisions on the DFCs after carefully weighing all of the facts discussed at numerous meetings and public forums where the Committee solicited public comments and input. The results of these efforts were reasonable, achievable, scientifically-based, and technically-sound DFCs that reflected all of the policy and technical considerations presented to, or discussed by, GMA-9. This process underlies all of the DFC actions taken by GMA-9 in the first round of joint planning, and to be discussed further in **Chapter 6.0**, GMA-9 DESIRED FUTURE CONDITIONS of this ER.

Table 14 lists the current DFCs for GMA-9, and **Table 15** lists the current MAG amounts (in acre-feet [ac-ft] for the Ellenburger-San Saba, Hickory, Marble Falls, Edwards Group of the Edwards-Trinity (Plateau),

and Trinity aquifers, and the applicable river basins and GMA-9 counties, resulting from the first round of joint planning.

Table 14. Current GMA-9 Desired Future Conditions

Aquifer	Desired Future Condition Summary	Date Desired Future Condition Adopted
Edwards Group of Edwards-Trinity (Plateau)	No net increase in average drawdown in Kendall and Bandera counties. Not relevant in Kerr and Blanco counties.	July 26, 2010
Ellenburger-San Saba	Allow for an increase in average drawdown of no more than 2 feet [in Blanco County].	August 29, 2008
Hickory	Allow for an increase in average drawdown of no more than 7 feet [in Blanco County].	August 29, 2008
Marble Falls	Allow for no net increase in average drawdown [in Blanco County].	August 29, 2008
Trinity	Allow for an increase in average drawdown of approximately 30 feet through 2060.	July 26, 2010

Source: TWDB, 2016b

Table 15. Current GMA-9 Modeled Available Groundwater Amounts

Aquifer	County	Regional Water Planning Area	River Basin	Modeled Available Groundwater (in ac-ft)						TWDB Report No.
				2010	2020	2030	2040	2050	2060	
Marble Falls	Blanco	K	Colorado	261	261	261	261	261	261	AA 10-14 MAG
Ellenburger-San Saba	Blanco	K	Colorado	2,655	2,655	2,655	2,655	2,655	2,655	AA 10-01 MAG
Ellenburger-San Saba	Blanco	K	Guadalupe	6	6	6	6	6	6	AA 10-01 MAG
Hickory	Blanco	K	Colorado	1,162	1,162	1,162	1,162	1,162	1,162	AA 10-02 MAG
Hickory	Blanco	K	Guadalupe	1	1	1	1	1	1	AA 10-02 MAG
Edwards –Trinity (Plateau)[3]	Bandera	J	Guadalupe	21	21	21	21	21	21	GR 10-049 MAG
Edwards –Trinity (Plateau)	Bandera	J	Nueces	101	101	101	101	101	101	GR 10-049 MAG
Edwards –Trinity (Plateau)	Bandera	J	San Antonio	561	561	561	561	561	561	GR 10-049 MAG
Edwards –Trinity (Plateau)	Kendall	L	Colorado	46	46	46	46	46	46	GR 10-049 MAG
Edwards –Trinity (Plateau)	Kendall	L	Guadalupe	103	103	103	103	103	103	GR 10-049 MAG
Edwards –Trinity (Plateau)	Kendall	L	San Antonio	169	169	169	169	169	169	GR 10-049 MAG
Trinity	Bandera	J	Guadalupe	76	76	76	76	76	76	GR 10-050 MAG
Trinity	Bandera	J	Nueces	903	903	903	903	903	903	GR 10-050 MAG
Trinity	Bandera	J	San Antonio	6,305	6,305	6,305	6,305	6,305	6,305	GR 10-050 MAG
Trinity	Bexar	L	San Antonio	24,856	24,856	24,856	24,856	24,856	24,856	GR 10-050 MAG
Trinity	Blanco	K	Colorado	1,322	1,322	1,322	1,322	1,322	1,322	GR 10-050 MAG

[3] These MAG amounts are for the Edwards-Trinity (Plateau) Aquifer as listed on the TWDB website. For clarification purposes, GMA-9 adopted the DFC statement for this aquifer on July 26, 2010 and defined it for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer. See Table 14 for GMA-9 DFC adopted statement.

Table 15. Current GMA-9 Modeled Available Groundwater Amounts

Aquifer	County	Regional Water Planning Area	River Basin	Modeled Available Groundwater (in ac-ft)						TWDB Report No.
				2010	2020	2030	2040	2050	2060	
Trinity	Blanco	K	Guadalupe	1,251	1,251	1,251	1,251	1,251	1,251	GR 10-050 MAG
Trinity	Comal	L	Guadalupe	6,906	6,906	6,906	6,906	6,906	6,906	GR 10-050 MAG
Trinity	Comal	L	San Antonio	3,308	3,308	3,308	3,308	3,308	3,308	GR 10-050 MAG
Trinity	Hays	K	Colorado	4,721	4,710	4,707	4,706	4,706	4,706	GR 10-050 MAG
Trinity	Hays	L	Guadalupe	4,410	4,410	4,410	4,410	4,410	4,410	GR 10-050 MAG
Trinity	Kendall	L	Colorado	135	135	135	135	135	135	GR 10-050 MAG
Trinity	Kendall	L	Guadalupe	6,028	6,028	6,028	6,028	6,028	6,028	GR 10-050 MAG
Trinity	Kendall	L	San Antonio	4,976	4,976	4,976	4,976	4,976	4,976	GR 10-050 MAG
Trinity	Kerr	J	Colorado	318	318	318	318	318	318	GR 10-050 MAG
Trinity	Kerr	J	Guadalupe	15,646	14,129	14,056	13,767	13,450	13,434	GR 10-050 MAG
Trinity	Kerr	J	Nueces	0	0	0	0	0	0	GR 10-050 MAG
Trinity	Kerr	J	San Antonio	471	471	471	471	471	471	GR 10-050 MAG
Trinity	Medina	L	Nueces	1,575	1,575	1,575	1,575	1,575	1,575	GR 10-050 MAG
Trinity	Medina	L	San Antonio	925	925	925	925	925	925	GR 10-050 MAG
Trinity	Travis	K	Colorado	8,920	8,672	8,655	8,643	8,627	8,598	GR 10-050 MAG
Edwards (BFZ)	EAA Jurisdiction	—	—	572,000	572,000	572,000	572,000	572,000	572,000	*See footnote

*** Edwards Aquifer Authority (EAA Jurisdiction)**

The modeled available groundwater (MAG) volume for the Edwards Aquifer (BFZ) within the jurisdiction of the Edwards Aquifer Authority is set by the Texas Legislature in the Edwards Aquifer Authority (EAA) Act (May 28, 2007, 8th Leg.). Section 1.14 (c) of the EAA Act states "the amount of per permitted withdrawals from the aquifer may not exceed or be less than 572,000 acre-feet per of water for each calendar year."

Counties within EAA's jurisdiction include all of Uvalde, Medina, and Bexar counties, and parts of Atascosa, Comal, Guadalupe, Caldwell, and Hays counties. The EAA is part of groundwater management areas (GMAs) 7,9,10 and 13. The available groundwater reflected here includes the amounts available for all GMAs within the EAA jurisdiction.

Source: TWDB, 2016c

These MAG amounts are contained in the 2016 RWPs for Regions J, K, and L.

As the result of DFCs adopted by GMA-9 in the first round of joint planning, three petitions were filed challenging the reasonableness of the adopted DFC for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer, and two petitions were filed challenging the reasonableness of the adopted DFC for the Trinity Aquifer. The appeals process regarding the Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFC was resolved during the five-year planning cycle, and GMA-9 adopted a DFC for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer on July 26, 2010. While GMA-9 also adopted a DFC for the Trinity Aquifer on July 26, 2010, the two appeals related to the Trinity Aquifer DFC extended finalizing this DFC to February 2012, when the TWDB determined this DFC to be reasonable.

5.0 GMA-9 PROPOSED NON-RELEVANT AQUIFER CLASSIFICATIONS

On April 18, 2016, GMA-9 voted to propose that all or portions of certain major and minor aquifers within the management area be classified as non-relevant aquifers for the purposes of joint planning pursuant to Rule §356.31 (b) (31 TAC §356.31 (b)). **Table 16** below lists the GMA-9 approved proposed non-relevant aquifer classifications for portions of the major and minor aquifers within GMA-9.

Table 16. Adopted GMA-9 Proposed Non-Relevant Aquifer Classifications (Major and Minor Aquifers)

PROPOSED NON-RELEVANT AQUIFER CLASSIFICATION	APPLICABLE AREAS WITHIN GMA-9 (ALL OR PORTIONS OF THE FOLLOWING COUNTIES, AS APPLICABLE)
Edwards Aquifer (Balcones Fault Zone)	Bexar, Comal, Hays, and Travis Counties
Edwards Group of Edwards-Trinity (Plateau)	Blanco and Kerr Counties
Ellenburger-San Saba	Blanco and Kerr Counties
Hickory	Blanco, Hays, Kerr, and Travis Counties
Marble Falls	Blanco County

As detailed in following discussion, GMA-9 determined that the aquifer characteristics, groundwater demands, and current groundwater uses for all or portions of these aquifers in GMA-9 do not warrant adopting a DFC. In these cases, Rule §356.31 (b) provides that a DFC is not required (31 TAC §356.31 (b)). Rule §356.31 (b) also identifies certain information that must be submitted to the TWDB regarding these proposed classifications (31 TAC Rule §356.31 (b)). For a discussion of these requirements, please refer to the previous discussion of the TWDB's rules under **Chapter 3.0** – STATUTORY AND REGULATORY REQUIREMENTS RELATED TO JOINT PLANNING AND DESIRED FUTURE CONDITIONS, **Section 3.2** – Title 31, Texas Administrative Code, Chapter 356.

GMA-9 elected to include the required documentation for these proposed non-relevant aquifer classifications in this ER. The following discussion provides GMA-9's rationale and documentation for proposing to classify portions of the major and minor aquifers listed in **Table 16** as non-relevant for the purposes of joint planning only. These proposed classifications do not in any manner impact a local GCD's ability or authority to manage these portions of these aquifers within their jurisdictional boundaries. These aquifers continue to be subject to the GCD's enabling statutes, rules, management plans, and programs, and a GCD's authorities and legal responsibilities can only be amended by an act of the Texas Legislature.

Lastly, the local relevance of these aquifers can continue to be addressed in the GCD's rules and management plans that can then be provided to the applicable RWPG to be incorporated into that region's RWP. If all or a portion of an aquifer is classified as non-relevant, and therefore no DFC or MAG are available, a groundwater availability amount could be determined by either the local GCD working with the RWPG to develop a quantity and incorporate that amount into the RWP, or developed by the TWDB for regional water planning purposes.

The following ER sections, reflecting the elements contained in Rule §356.31 (b), provide discussions regarding GMA-9's justifications for proposing these classifications and determining that a DFC is not warranted. A detailed discussion for each of the five aquifers listed in **Table 16** is provided.

5.1 Major Aquifers

GMA-9 is proposing to classify portions of the Edwards Aquifer (BFZ) and the Edwards Group of the Edwards-Trinity (Plateau) Aquifer located within GMA-9 as non-relevant for the purposes of joint planning.

5.1.1 Edwards Aquifer (BFZ)

GMA-9 is proposing to classify the Edwards Aquifer (BFZ) located within those portions of Bexar, Comal, Hays, and Travis counties within the GMA-9 boundaries as non-relevant for the purposes of joint planning. This proposed classification does not impact either the BSEACD's authority or ability to manage that portion of Edwards Aquifer's "Barton Springs segment" located in portions of Hays and Travis counties, or the EAA's authority or ability to manage the Edwards Aquifer's "San Antonio segment" located in portions of Bexar, Comal, and Hays counties, as this aquifer remains within these GCDs' jurisdictional boundaries and continues to be subject to their enabling statutes, rules, management plans, and programs.

5.1.1.1 Aquifer Portion Description, Location and Map

The following describes the portion of the Edwards Aquifer (BFZ) that GMA-9 is proposing to classify as non-relevant.

The Edwards Aquifer (BFZ) is a major aquifer in the south-central part of Texas. The Balcones Escarpment defines the southern and eastern edges of the Edwards Plateau. Total area of outcrop for the aquifer is 1,560 square miles, with a 2,314 square mile subsurface area. Thirteen Texas counties contain portions of the aquifer, with 90 percent of the aquifer located within a GCD. Within GMA-9, the Edwards Aquifer is located within the BSEACD and EAA[4]. The total area of the aquifer within GMA-9 is 124,185 acres; the outcrop area is 107,206 acres, or 86 percent of the total area.

The San Antonio segment is located along the southern and southeastern portions of GMA-9 within Bexar, Comal, and Hays counties. The San Antonio segment of the Edwards Aquifer in its entirety extends through parts of Kinney, Uvalde, Zavala, Medina, Frio, Atascosa, Bexar, Comal, Guadalupe, and Hays counties, and covers an area approximately 180 miles long and five to 40 miles wide. The total surface area overlying the aquifer is approximately 3,600 square miles. In addition to GMA-9, the San Antonio segment of the Edwards Aquifer is geographically located within GMAs 7, 10, and 13.

The Edwards Aquifer (BFZ) Barton Springs segment is located in portions of Hays and Travis counties. The southern extent is located between Bear Creek and the Blanco River. The Barton Springs segment of the Edwards Aquifer (BFZ) is located north of the Colorado River in Travis, Williamson, and southern Bell counties. This segment is located within GMA 8. The portion located in Bell County lies within the jurisdiction of the Clearwater Underground Water Conservation District (UWCD).

[4] While a portion of the Edwards Aquifer in Hays County is geographically located within the HTGCD's boundaries, this GCD does not have jurisdiction over the Edwards Aquifer (BFZ).

The proposed non-relevant portions of the Edwards Aquifer (BFZ) within the boundaries of GMA-9 are depicted in **Figure 12** below.

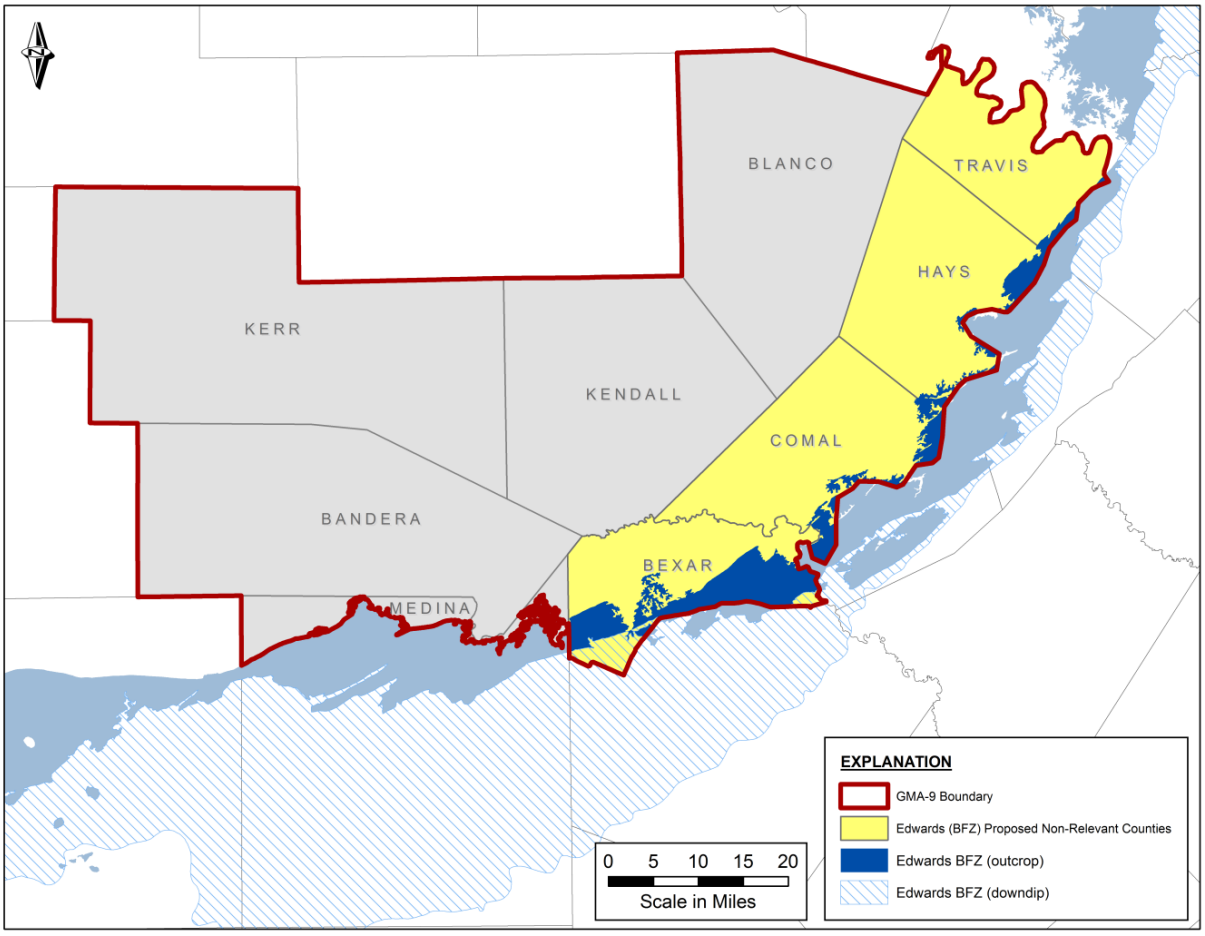

Figure 12. Proposed non-relevant portions of Edwards Aquifer (BFZ) within GMA-9.

5.1.1.2 Aquifer Characteristics, Groundwater Demands, Current Groundwater Uses, Including Total Estimated Recoverable Storage (TERS)

The following describes the aquifer characteristics, groundwater demands, and current groundwater uses, including the TERS amounts calculated by the TWDB, for the portion of the Edwards Aquifer (BFZ) that GMA-9 is proposing to classify as non-relevant that support the conclusion that DFCs in adjacent or hydraulically-connected relevant aquifer(s) will not be affected.

Characteristics, including other GMA DFCs for the aquifer

The Edwards Aquifer (BFZ) consists of the limestone of the Edwards Group as wells as the Georgetown Formation and the Comanche Peak Limestone, where present. The Edwards Aquifer is between 200 and 600 ft thick, and is a limestone karst aquifer with much of the groundwater flow occurring along solution-enlarged openings along joints, faults, and fractures.

Groundwater is present in the Edwards Aquifer (BFZ) under water table conditions in the outcrop area and under confined or artesian conditions in the downdip portion of the formation. It is in the artesian section that most of the groundwater is produced from the Edwards Aquifer. A groundwater divide present near Kyle in Hays County divides the aquifer into two separate hydrologic regions.

The Edwards Aquifer (BFZ) is a karst aquifer and is characterized by the presence of sinkholes, sinking streams, caves, large springs, and highly productive water wells. Karst aquifers are considered triple permeability aquifers - water is contained in the rock matrix, in fractures and faults, and in caves and conduits. Conduits or solution channels within the aquifer range from the size of a finger to tens of feet in diameter. The interconnected fractures and conduits in the Edwards Aquifer accounts for its extremely high yielding wells and springs. As is characteristic of many karst aquifers, the aquifer exhibits extremely high (cavernous) porosity and permeability, allowing for the transmission of large volumes of water and enabling groundwater levels within the aquifer to respond quickly to rainfall events (known as recharge). The large interconnected openings in the rock also exhibit a diverse fauna of more than 40 species including eyeless salamanders, shrimp, and two species of catfish.

Because of the karstic nature of the Edwards Aquifer (BFZ), it responds very quickly both to pumping and to recharge. Recharge occurs mainly through the infiltration of precipitation that runs off into local streams and rivers. Much of the recharge occurs in very short periods of time that occur with high precipitation events typical of this area of the State. Discharge from the aquifer is to several very large springs emanating from the aquifer and to pumping from the aquifer. The largest springs in the State flow from the Edwards Aquifer.

The Edwards Aquifer (BFZ) feeds several well-known springs, including Comal Springs in Comal County, which is the largest spring in the State, and San Marcos Springs in Hays County, which is the second largest. Hueco, San Pedro, San Antonio, and Leona springs also discharge from the aquifer. Because of the aquifer's highly permeable nature, water levels and spring flows respond quickly to rainfall, drought, and pumping.

Below is a summary of the current GMA 8, 10, and 13 DFCs for the Edwards Aquifer (BFZ). GMA 7 did not set a DFC for the Edwards Aquifer (BFZ).

<u>GMA 8 DFCs for the Edwards Aquifer (BFZ) (Northern segment) (December 17, 2007)</u> –

- Maintain at least 100 ac-ft per month stream/spring flow in Salado Creek during a repeat of the Drought of Record in Bell County.
- Maintain at least 42 ac-ft per month of aggregated stream/spring flow during a repeat of the Drought of Record in Travis County.
- Maintain at least 60 ac-ft per month of aggregated stream/spring flow during a repeat of the Drought of Record in Williamson County.

GMA 10 DFCs for the fresh and saline zones of the Edwards Aquifer (Barton Springs segment) and for the Edwards Aquifer within Kinney County (August 4, 2010) –

- Freshwater Zone:
    - Spring flow of Barton Springs during average recharge conditions shall be no less than 49.7 cubic feet per second (cfs) averaged over an 84-month (seven-year) period; and

    - During extreme drought conditions, including those as severe as a recurrence of the 1950s Drought of Record, spring flow of Barton Springs shall be no less than 6.5 cfs, averaged on a monthly basis.

- Saline Zone:
    - Well drawdown at the saline-freshwater interface (The so-called Edwards "Bad Water Line") in the Northern Subdivision of GMA-10 that averages no more than 5 ft and does not exceed a maximum of 25 ft at any one point on the interface.

GMA 13 DFC for the portion of the Edwards Aquifer within Frio County (August 12, 2010) –

- Maintain an average Artesian Flow of 500 gallons per minute from wells producing from the Edwards Aquifer in Frio County.

Groundwater Demands

The EAA reported that as of September 2015, there were 129 Edwards Aquifer wells regulated by the EAA located within GMA-9's boundaries. Of those wells, 91 are classified as non-exempt (municipal, industrial, or irrigation use) and 38 are exempt (domestic or livestock use). The non-exempt wells are permitted to produce no more than 7,007.921 ac-ft annually[5], and the exempt wells are estimated to produce a total of approximately 24 ac-ft annually. **Figure 13** and **Figure 14**, respectively, show the locations of all non-exempt and exempt wells located within the San Antonio segment of the Edwards Aquifer in GMA-9 in the EAA's boundaries.

[5] The total permitted amount of 7,007.921 ac-ft does not include permits associated with three of the 91 wells. Those three wells are associated with the San Antonio Water System's infrastructure, and when combined, produce less than 2,000 ac-ft/year.

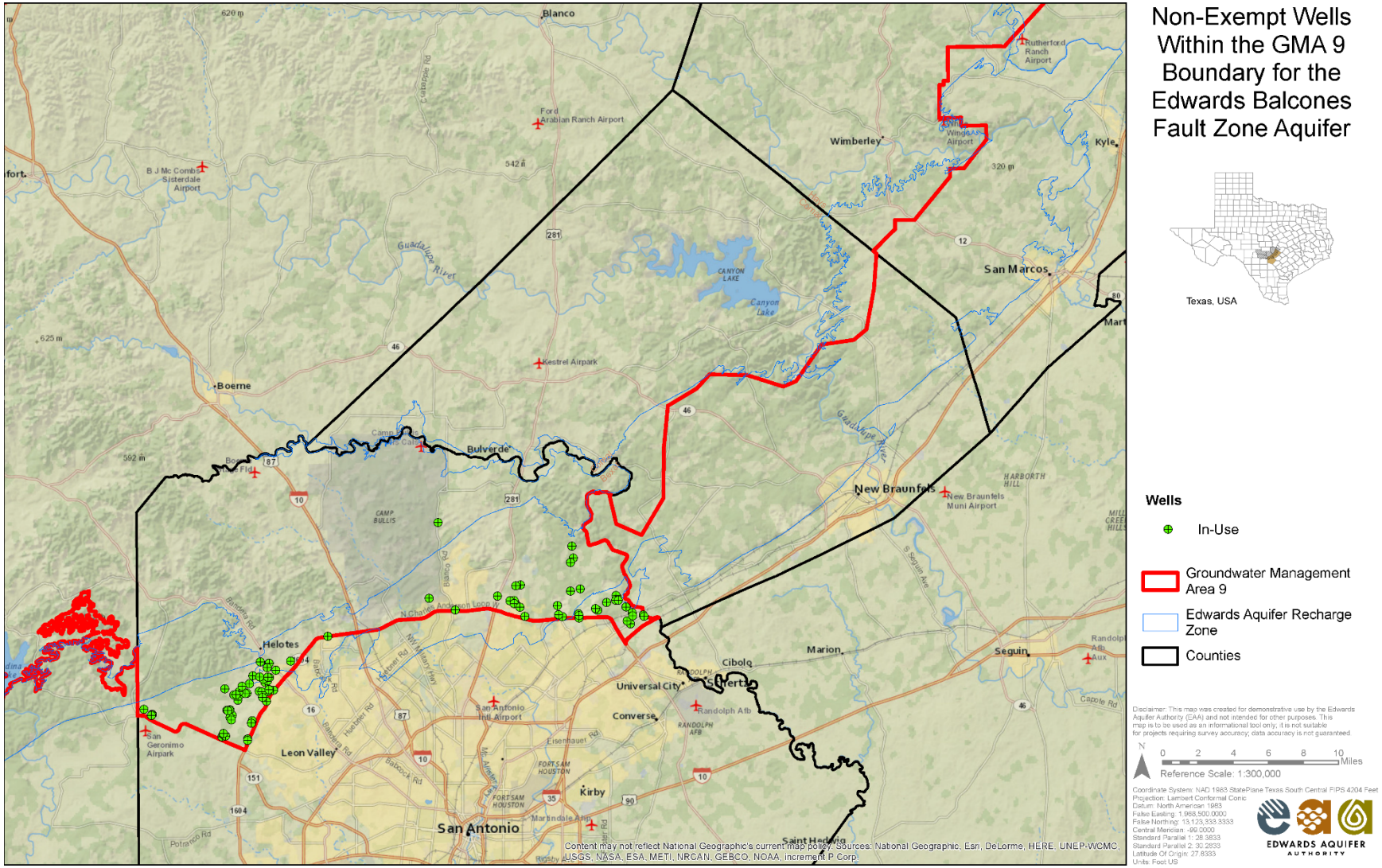

Figure 13. Edwards Aquifer (BFZ) EAA non-exempt wells within GMA-9.

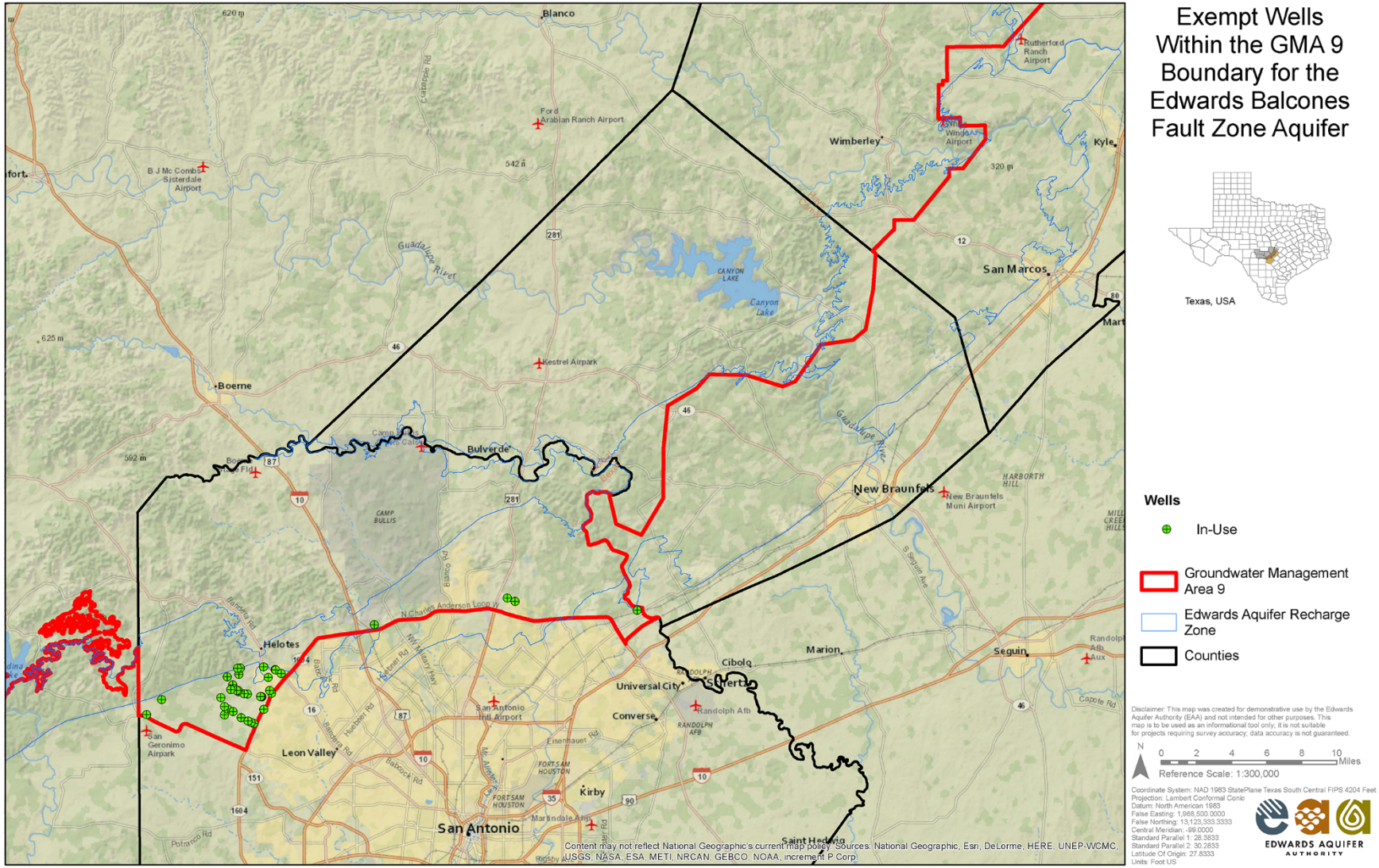

Figure 14. Edwards Aquifer (BFZ) EAA exempt wells within GMA-9.

Current Groundwater Uses/Total Estimated Recoverable Storage

Water from the aquifer is primarily used for municipal, irrigation, and recreational purposes. San Antonio obtains almost all of its water supply from the Edwards Aquifer (BFZ). There are three main uses for groundwater within the Edwards Aquifer: municipal, irrigation, and industrial.

Table 17 presents the TERS volume estimates calculated by the TWDB for the Edwards Aquifer (BFZ).

Table 17. Edwards Aquifer (Balcones Fault Zone) – Total Estimated Recoverable Storage Amounts within GMA-9 (by Groundwater Conservation District)[6]

GMA-9 GCD	Total Storage (ac-ft)	25% of Total Storage (ac-ft)	75% of Total Storage (ac-ft)
No GCD	24,000	6,000	18,000
BSEACD	15,000	3,750	11,250
EAA	220,000	55,000	165,000
HTGCD	4,500	1,125	3,375
Totals	**263,500**	**65,875**	**197,625**

Source: Jones and Bradley, 2013

GCDs are required to consider the TERS volume prior to proposing a DFC. The TERS is defined as a porosity-adjusted volume of groundwater that might be recovered from the aquifer assuming 25 percent or 75 percent recovery. The numbers should be considered as a very simplistic approach to estimating an upper limit volume of available groundwater on a volumetric basis only. The TERS numbers are based on porosity-adjusted volumetric calculations of projected geologic formations without detailed local subsurface data. The TERS is an estimate of total "water-in-place," but there are many other factors that must be considered in assessing groundwater availability and DFCs. This observation regarding the TERS applies to other aquifers in this report.

In addition, GMA-9 believes the TERS values shown above for the Edwards Aquifer (BFZ) in Hays County and southern Travis County are much smaller based upon previous mapping conducted by the BSEACD in 2004 (Hunt and Smith, 2004).

Conclusions Regarding Non-Impacts to Adjacent or Connected Aquifers

Due to the overriding regulatory authority of the EAA, the portion of the Edwards Aquifer located within GMA-9 has been essentially rendered non-relevant for local GCDs participating in joint planning. As dictated by the EAA, any well completion that penetrates the Edwards Aquifer must seal off the Edwards section of the well. The GCDs have no rules that allow for permitted wells to be drilled in the Edwards Aquifer. Generally, any production from the Edwards is within rural areas and is designated as exempt use. The designation of the portions of the Edwards Aquifer (BFZ) within GMA-9 in Bexar, Comal, Hays, and Travis counties will have no effect on joint planning efforts for this resource.

[6] Even though the TWDB TERS table for the Edwards Aquifer (BFZ) lists the HTGCD, this GCD does not have jurisdiction to manage that portion of this aquifer located within its boundaries.

5.1.1.3 Edwards Aquifer (Balcones Fault Zone) As Non-Relevant for Joint Planning Purposes within GMA-9

The following is an explanation of why GMA-9 is proposing to classify the Edwards Aquifer (BFZ) as non-relevant for the purposes of joint planning in those portions of Bexar, Comal, Hays, and Travis counties within GMA-9:

- The Edwards Aquifer is under the regulatory and management jurisdiction of the EAA and the BSEACD.
- Both a DFC and MAG amount were set for the entirety of the EAA-regulated portion of the Edwards Aquifer (BFZ) (San Antonio segment), when they were adopted by statute during the 80th Regular Session of the Texas Legislature, and can only be amended through subsequent legislative actions.
- Specifically, Sections 1.14(a), (f) and (h), and Section 1.26 of the EAA Act serve as the current DFCs, and Section 1.14(c) of the EAA Act serves as the MAG amount (equating to 572,000 ac-ft of permitted withdrawals each calendar year to be used for municipal, industrial, and irrigation purposes, for the San Antonio segment of the Edwards Aquifer (BFZ) (EAA, 2016).
- The language contained in the EAA Act reflects the legislature's determination of the appropriate balance between the highest practicable use of groundwater production and the conservation, preservation, recharging, and prevention of waste within the San Antonio segment, and precludes the use of a GAM for purposes of quantification.
- This statutory language prohibits GMA-9 from subdividing the San Antonio segment for the purposes of establishing different, GMA-specific DFCs, and precludes GMA-9 from considering any alternative DFCs.
- These DFCs and MAG for the San Antonio segment cannot be changed during this or any joint planning process and can only be changed by amending the EAA Act, and any public comment or concerns regarding the established DFC and MAG for the San Antonio segment should ultimately be expressed to the Texas Legislature rather than GMA-9. Therefore, it is not possible for GMA-9 to have a meaningful vote on the management of this segment of the aquifer.
- The TWDB has concurred that this language and production limitation in the EAA Act function as the DFCs and MAG amount for the San Antonio segment of the Edwards Aquifer.
- Both the DFC and MAG amount are considered overarching, applying equally to all portions of the San Antonio segment of the Edwards Aquifer, regardless of which GMA the area happens to be located in, with the vast majority of it being located within GMA 10, and under the jurisdiction of the EAA and the BSEACD.
- The Edwards Aquifer in the BSEACD contains a very small amount of water. The BSEACD rules only allow exempt wells to be drilled in this portion of the Edwards Aquifer.
- The amount of pumping in the Edwards Aquifer occurring within GMA-9 is under the management of the EAA and BSEACD, and no other GCDs within GMA-9 have any jurisdiction over this

aquifer. The proposed designation for these portions of the Edwards Aquifer (BFZ) as non-relevant will have no effect on users located in the downdip sections of the aquifer because the EAA regulates all pumping from the San Antonio segment of Edwards Aquifer (BFZ) within GMA-9, and the BSEACD regulates all pumping from the Barton Springs segment of the aquifer within GMA-9.

- The Edwards Aquifer will continue to be managed locally by these two GCDs.

Due to these many unique issues, the EAA was removed from the joint planning process by legislative action in 2015 with the passage of S. B. No. 1336 and will not be a formal part of the joint planning process moving forward. For region-wide planning purposes only, the Region L RWPG considered both the above-mentioned MAG and additional, mandated reductions in groundwater availability related to conservation measures within the EAA's Habitat Conservation Plan and its associated Incidental Take Permit issued by the U. S. Fish &Wildlife Service in 2013.

In summary, GMA-9 determined that the aquifer characteristics, groundwater demands, and current groundwater uses for that portion of the Edwards Aquifer (BFZ) located in GMA-9 do not warrant adopting a DFC. Therefore, GMA-9 is proposing that this aquifer located within its boundaries, specifically in parts of Bexar, Comal, Hays, and Travis counties, be classified as non-relevant for joint planning purposes.

5.1.2 Edwards Group of the Edwards-Trinity (Plateau) Aquifer

GMA-9 is proposing to classify the Edwards Group of the Edwards-Trinity (Plateau) Aquifer located within those portions of Blanco and Kerr counties within the GMA-9 boundaries as non-relevant for the purposes of joint planning. This proposed classification does not impact either the BPGCD's authority or ability to manage that portion of the Edwards Group of the Edwards-Trinity (Plateau) Aquifer located in Blanco County, or the HGCD's authority or ability to manage that portion of the aquifer located in Kerr County, as these portions of this aquifer remain within these GCDs' jurisdictional boundaries and continue to be subject to their enabling statutes, rules, management plans, and programs.

5.1.2.1 Aquifer Portion Description, Location and Map

The following describes the portion of the Edwards Group of the Edwards-Trinity (Plateau) Aquifer that GMA-9 is proposing to classify as non-relevant.

The Edwards Group of the Edwards-Trinity (Plateau) Aquifer is a major aquifer extending across much of the southwestern part of Texas. Total area of outcrop for the aquifer is 32,294 square miles, with a 2,988 square mile subsurface area. Forty Texas counties contain portions of the aquifer, with 71 percent of the aquifer located within GCDs. Within GMA-9, the Edwards Group is located within the BCRAGD, BPGCD, CCGCD, and HGCD. The total area of the aquifer within GMA-9 is 736,472 acres, and all of this acreage is outcrop area. The total area of the non-relevant portion of the aquifer that is located in Kerr and Blanco counties is 456,791 acres, or approximately 714 square miles.

The proposed non-relevant portions of the Edwards Group of the Edwards-Trinity (Plateau) Aquifer within the boundaries of GMA-9 are depicted in **Figure 15**.

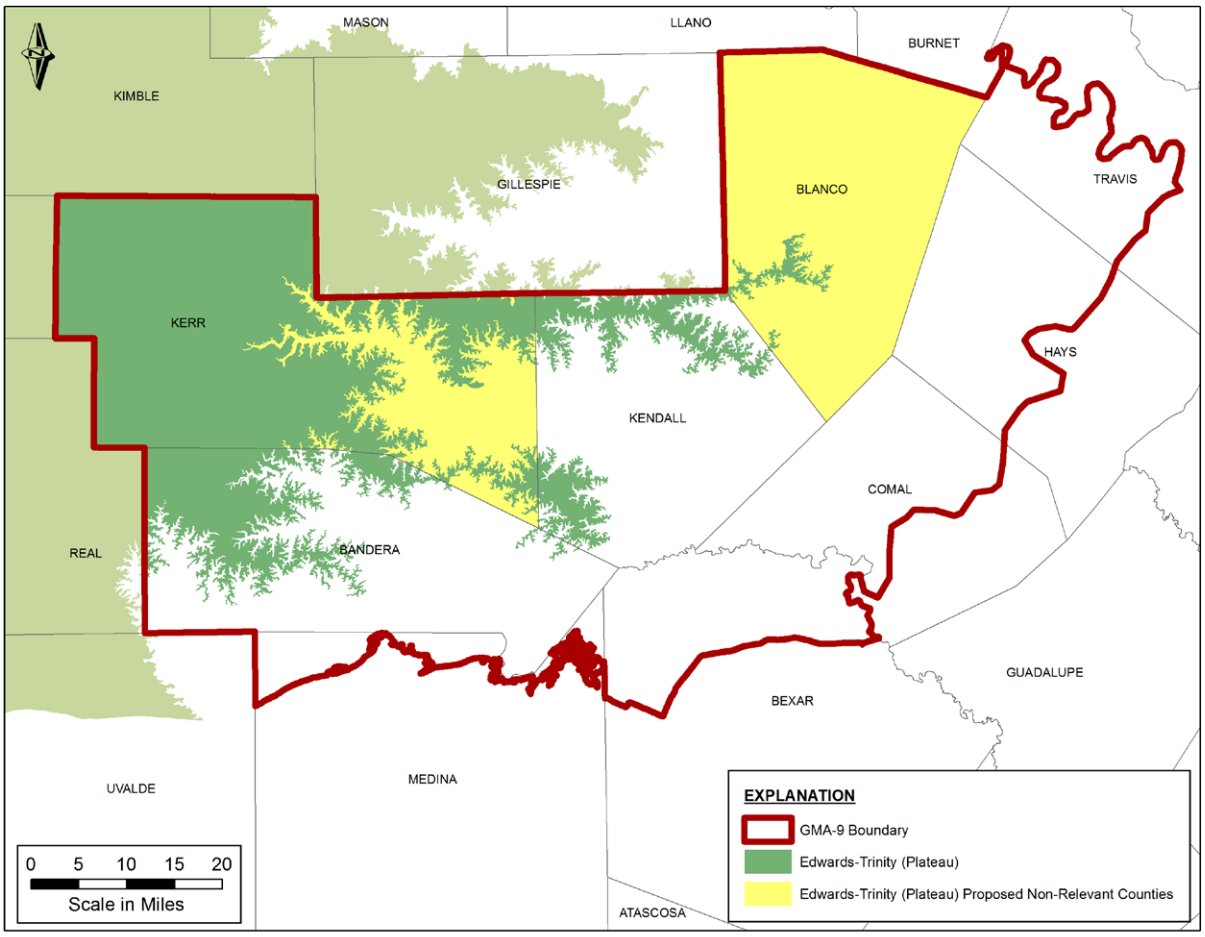

Figure 15. Proposed non-relevant portions of Edwards Group of Edwards-Trinity (Plateau) Aquifer within GMA-9.

5.1.2.2 Aquifer Characteristics, Groundwater Demands, Current Groundwater Uses, Including Total Estimated Recoverable Storage (TERS)

The following describes the aquifer characteristics, groundwater demands, and current groundwater uses, including the TERS amounts, for the portion of the Edwards Group of the Edwards-Trinity (Plateau) Aquifer that GMA-9 is proposing to classify as non-relevant that support the conclusion that DFCs in adjacent or hydraulically connected relevant aquifer(s) will not be affected.

Characteristics, including other GMA DFCs for the aquifer

The Edwards Group of the Edwards-Trinity (Plateau) Aquifer within GMA-9 is located at higher elevations. It is comprised of relatively thin layers of limestone and dolomite that is an extension of the Edwards Plateau from the west. The upper Edwards portion of the aquifer system is generally more porous and permeable than the underlying Trinity, and where exposed at the land surface, the Edwards-Trinity (Glen Rose) interface gives rise to numerous springs that form the headwaters of several eastward and southerly flowing rivers. In general, yields from the aquifer are low (less than 20 gpm) and the water is used occasionally for rural domestic and livestock demands.

Groundwater in the Edwards Group occurs under both confined and unconfined conditions. Recharge is primarily through the infiltration of precipitation on the outcrop, in particular where the limestone formations outcrop. Discharge is to wells and to the Frio, Medina, Nueces, and Guadalupe rivers in the Hill Country area. Groundwater flow in the Edwards Group is generally in a south-southeasterly direction, but may vary locally. The hydraulic gradient averages about 10 ft/mile.

The water-bearing units of the Edwards Group portion in the Edwards-Trinity (Plateau) Aquifer are composed predominantly of limestone and dolomite of the Edwards. The aquifer crops out in a small portion of western Blanco County, in northern Kendall County, and in a majority of Kerr County.

The Edwards Group of the Edwards-Trinity (Plateau) Aquifer within Blanco County is scattered across the west central part of the county and is located at higher elevations along ridges. It is comprised of relatively thin layers of limestone and dolomite that is an extension of the Edwards Plateau into Blanco County from the west. The Edwards Group in Blanco County exists in an unconfined condition. Recharge is solely from local precipitation occurring over the outcrop. Water not pumped from wells will generally discharge from small seeps and springs at the base of the Edwards outcrop and provides base flow to small streams within the county.

Below is a summary of the current GMA 3, 4, and 7 DFCs for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer.

<u>GMA 3 DFCs for the Edwards Group of Edwards-Trinity (Plateau) Aquifer (August 9, 2010)</u> –

- The average total net decline in water levels within GMA-3, taken as a whole, at the end of the fifty-year period in 2060, shall not exceed twenty eight (28) ft below water levels in aquifers in the year 2010; and
- The results of Scenario 11 of the TWDB GAM-Run 09-35 version-r single-layer model) used to develop the DFC for the Edwards-Trinity (Plateau)/Pecos Valley Aquifers within GMA-3 are adopted in their entirety.

<u>GMA 4 DFCs for the Edwards Group of Edwards-Trinity (Plateau) Aquifer (August 13, 2010; amended on May 19, 2011)</u> –

- A 0-foot drawdown for Brewster County GCD; and
- A 50-foot drawdown for Culberson County GCD.

<u>GMA 7 DFCs for the Edwards Group of Edwards-Trinity (Plateau) Aquifer (July 29, 2010)</u> –

- An average drawdown of 7 ft, except for the Kinney County GCD, based on Scenario 10 of the TWDB GAM run 09-35 which is incorporated in its entirety into this resolution; and
- In Kinney County, that drawdown which is consistent with maintaining, at Los Moras Springs, An annual average flow of 23.9 cfs and a median flow of 24.4 cfs based on scenario 3 of the TWDB's flow model presented on July 27, 2010.

Groundwater Demands

Yields from the Edwards Group of the Edwards-Trinity (Plateau) Aquifer in Blanco County are low (<20 gpm) and the water, if used at all, is used occasionally for rural domestic and livestock demands. No non-exempt wells producing from the Edwards Group were identified by the BPGCD, as of May 2008.

Current Groundwater Uses/TERS

Table 18 presents the TERS volume estimates calculated by the TWDB for the Edwards Group.

Table 18. Edwards Group of Edwards-Trinity (Plateau) Aquifer – Total Estimated Recoverable Storage Amounts within GMA-9 (by Groundwater Conservation District)

GMA-9 GCD	Total Storage (ac-ft)	25% of Total Storage (ac-ft)	75% of Total Storage (ac-ft)
BCRAGD	450,000	112,500	337,500
BPGCD	12,000	3,000	9,000
CCGCD	96,000	24,000	72,000
HGCD	1,800,000	450,000	1,350,000
Totals	**2,358,000**	**589,500**	**1,768,500**

Source: Jones and Bradley, 2013

The following estimates (**Table 19**) are from the TWDB water use database. Year 2013 was the most recent year of available data. Only those counties that are located within GMA-9 that have estimated use are included. If a county is not listed, then there is no estimated use in TWDB water use surveys.

Table 19. Edwards Group of Edwards-Trinity (Plateau) Aquifer Estimated 2013 Groundwater Use (by GMA-9 County)

GMA-9 County	Type of Use and Estimated Use Amount for 2013 (in ac-ft)						
	Municipal	Manufacturing	Mining	Steam Electric Power	Irrigation	Livestock	Totals
Bandera	66	0	0	0	0	69	**135**
Blanco	0	0	0	0	0	1	**1**
Hays	0	0	0	0	0	5	**5**
Kendall	53	0	0	0	0	17	**70**
Kerr	859	0	0	0	66	163	**1,088**
Totals	**978**	**0**	**0**	**0**	**66**	**255**	**1,299**

Source: TWDB Water Use Survey Team, Historical Pumping Estimates

Estimates indicate that current use of the Edwards Group of the Edwards-Trinity (Plateau) Aquifer in GMA-9 is primarily for municipal use in Kerr, Bandera, and Kendall counties.

TWDB recently derived exempt use estimates based on 2010 Census Data, TWDB population projections, TWDB Water Use Survey data, TWDB water demand projections, and the TWDB water well database.

The exempt use estimates for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer (**Table 20**) are as follows:

Table 20. Edwards Group of Edwards-Trinity (Plateau) Aquifer Estimated Exempt Use (by GMA-9 Groundwater Conservation District)

	Estimated Exempt Use by Year (in ac-ft)						
GMA-9 GCD	**2015**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
BCRAGD	181	206	230	242	249	251	253
BSEACD	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BPGCD	2	2	2	2	2	2	2
CTGCD	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CCGCD	41	41	46	51	57	62	67
EAA	n/a	n/a	n/a	n/a	n/a	n/a	n/a
HTGCD	n/a	n/a	n/a	n/a	n/a	n/a	n/a
HGCD	926	1,069	1,188	1,230	1,267	1,296	1,318
MCGCD	n/a	n/a	n/a	n/a	n/a	n/a	n/a
TGRGCD	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Estimated Exempt Use Totals	**1,050**	**1,262**	**1,259**	**1,525**	**1,575**	**1,611**	**1,640**

Source: TWDB Projected Exempt Groundwater Use Estimates, GMA-9, December 2015

Based on these estimates, most exempt use pumping in the Edwards Group in GMA-9 occurs in Kerr County.

Conclusions Regarding Non-Impacts to Adjacent or Connected Aquifers

The proposed non-relevant status of this aquifer in Blanco and Kerr counties will not affect other users, proximal GCDs, or other entities involved in the joint planning purposes for the Edwards portions of this aquifer that exists within the GMA-9 boundary.

5.1.2.3 Edwards Group of Edwards-Trinity (Plateau) Aquifer as Non-Relevant for Joint Planning Purposes within GMA-9

The following is an explanation of why GMA-9 is proposing to classify the Edwards Group of the Edwards-Trinity (Plateau) Aquifer as non-relevant for the purposes of joint planning in those portions of Blanco and Kerr counties within GMA-9.

The TWDB calculated the following possible MAG volumes in GMA-9 for this aquifer during the first round of joint planning: Bandera County – 683 ac-ft; Kendall County – 318 ac-ft; and Kerr County – 1,035 ac-ft. GMA-9 has elected to set a DFC for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer in Bandera and Kendall counties. The aquifer does not extend into Medina, Bexar, Comal, Hays, or Travis counties.

GMA-9 is proposing to classify the Edwards Group of the Edwards-Trinity (Plateau) Aquifer as non-relevant for the purposes of joint planning in Blanco and Kerr counties for the following reasons:

- The Trinity Aquifer is the principal source of groundwater in Kerr County. No significant pumping occurs from the Edwards Group of the Edwards-Trinity (Plateau) Aquifer in Blanco and Kerr counties. Any pumping that does occur is likely designated for an exempt use in rural portions of the counties.
- The proposed non-relevant status of this aquifer in Blanco and Kerr counties will not affect other users, proximal GCDs, or other entities involved in joint planning for the Edwards portions of this aquifer that exists within the GMA-9 boundary.

GMA-9 also stated the following reasons for designating the Edwards Group of the Edwards-Trinity (Plateau) Aquifer as non-relevant for the purposes of joint planning in Blanco and Kerr counties during the first round of joint planning:

Blanco County –

- On July 26, 2010, GMA-9 declared the portion of the Edward Group of the Edwards-Trinity (Plateau) Aquifer located within Blanco County to be "not relevant" based on TWDB GAM Run 08-90 (Chowdhury, 2009), which stated:

  > *"The Edwards Group of the Edwards-Trinity (Plateau) Aquifer also extends out to a small area in the central part of Blanco County. However, this portion of the aquifer was not considered in the calculation of managed available groundwater as the aquifer was considered to be too thin to be suitable for meaningful groundwater production,"* (GMA-9, 2010b, p. 2 and Chowdhury, 2009, p. 3).

- The BPGCD had no record of any well producing water from this aquifer, which was limited to an approximate thickness of 30-60 ft, and capped some of the hills in west-central Blanco County.

This rationale, originally provided by the BPGCD and adopted by GMA-9 during the first round of joint planning, is still applicable at this time.

Kerr County –

- On July 26, 2010, GMA-9 voted to declare that portion of the Edwards Group of the Edwards-Trinity (Plateau) Aquifer located within Kerr County to be "not-relevant" based on rationale provided by the HGCD.
- On July 14, 2010, the HGCD Board of Directors voted to submit to GMA-9 they declare the Edwards Group of the Edwards-Trinity (Plateau) Aquifer to be "not relevant" at that time, and that they not set a DFC. The GCD reasoned that this aquifer should be declared as not relevant in Kerr County because: 1) the Edwards Group of the Edwards-Trinity (Plateau) Aquifer was considered to be less than 10 percent of groundwater use in Kerr County; 2) their rules prohibited non-exempt wells to be drilled into this aquifer; and 3) pumping from this aquifer was from exempt wells primarily used for domestic and livestock purposes and the GCD's ability to regulate these wells was limited (GMA-9, 2010b).

This rationale adopted by GMA-9 during the first round of joint planning is still applicable at this time. In addition, the Edwards Group of the Edwards-Trinity (Plateau) Aquifer will continue to be managed locally by the individual GCDs that have jurisdiction.

In summary, GMA-9 determined that the aquifer characteristics, groundwater demands, and current groundwater uses for that portion of the Edwards Group of the Edwards-Trinity (Plateau) Aquifer located in GMA-9 do not warrant adopting a DFC. Therefore, GMA-9 is proposing that this aquifer located within its boundaries, specifically in parts of Blanco and Kerr counties, be classified as non-relevant for joint planning purposes.

5.2 Minor Aquifers

GMA-9 is also proposing to classify portions of the Ellenburger-San Saba, Hickory, and Marble Falls aquifers located within GMA-9 as non-relevant for the purposes of joint planning.

5.2.1 Ellenburger-San Saba Aquifer

GMA-9 is proposing to classify the Ellenburger-San Saba Aquifer located within Blanco and Kerr counties within GMA-9 as non-relevant for the purposes of joint planning. This proposed classification does not impact either the BPGCD's authority or ability to manage this portion of the aquifer located in Blanco County, or the HGCD's authority or ability to manage the portion of this aquifer located in Kerr County, as these portions of the aquifer are within these GCDs' jurisdictional boundaries and continue to be subject to their enabling statutes, rules, management plans, and programs.

5.2.1.1 Aquifer Portion Description, Location, and Map

The following describes the portion of the Ellenburger-San Saba Aquifer that GMA-9 is proposing to classify as non-relevant.

The Ellenburger-San Saba Aquifer is a minor aquifer that is found in the Llano Uplift area of central Texas. Total area of outcrop for the aquifer is 1,147 square miles, with a 4,262 square mile subsurface area. Sixteen Texas counties contain portions of the aquifer, with 84 percent of the aquifer located within a GCD. Within GMA-9, the Ellenburger-San Saba Aquifer is located within the BPGCD, CCGCD, and HGCD. The total area of the aquifer within GMA-9 is 479,619 acres; the outcrop area is 47,890 acres, or eleven percent of the total area.

The proposed non-relevant portions of the Ellenburger-San Saba Aquifer within GMA-9 are depicted in **Figure 16**.

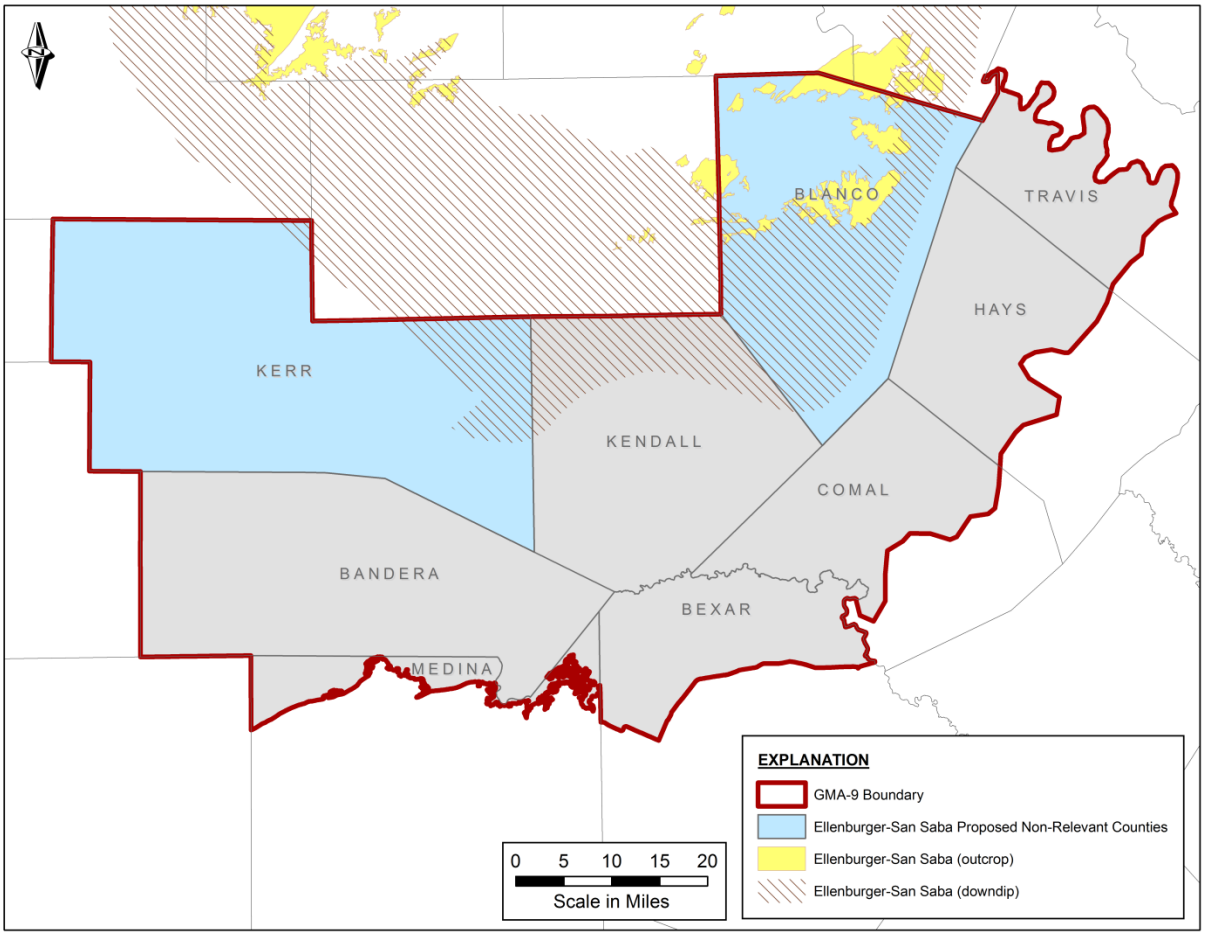

Figure 16. Proposed non-relevant portions of Ellenburger-San Saba Aquifer within GMA-9.

5.2.1.2 Aquifer Characteristics, Groundwater Demands, Current Groundwater Uses, Including Total Estimated Recoverable Storage (TERS)

The following describes the aquifer characteristics, groundwater demands, and current groundwater uses, including the TERS amounts, for the portion of the Ellenburger-San Saba Aquifer that GMA-9 is proposing to classify as non-relevant that support the conclusion that DFCs in adjacent or hydraulically connected relevant aquifer(s) will not be affected.

Characteristics, including other GMA DFCs for the aquifer

The Ellenburger-San Saba Aquifer is a Cambrian age limestone and dolomite aquifer that occurs in parts of 15 counties in the Llano Uplift area of central Texas. Most of the water produced from this aquifer is used for municipal water supply purposes, mainly in Mason, McCulloch, and Menard counties. The cities of Fredericksburg, Johnson City, Bertram, and Richland Springs have all used the Ellenburger-San Saba Aquifer as a public water supply.

The Ellenburger-San Saba Aquifer consists of limestones and dolomites of the San Saba Member of the Wilberns Formation and the Ellenburger Group. The Ellenburger-San Saba Aquifer was highly eroded prior to being covered by sediments, which results in a large variation in thickness, ranging from 0 to 1,000 ft.

The aquifer generally encircles the Llano Uplift, and the downdip portion extending to depths of approximately 3,000 ft below land surface. In some areas the overlying beds are thin or absent, and here the Ellenburger-San Saba Aquifer may be hydrologically connected to the Marble Falls Aquifer. Local and regional block faulting has significantly compartmentalized the Ellenburger-San Saba, but dissolution along such faulting and related fractures has formed various sized cavities, which are the major water-bearing features of the aquifer.

Average effective recharge from precipitation is estimated to be 2 percent of annual precipitation (Preston et al., 1996) and is only applied to outcrop areas. Groundwater in the Ellenburger-San Saba Aquifer primarily occurs in the dissolution cavities formed along faults and related fractures. Groundwater is found mostly under artesian conditions, even in much of the outcrop area. The depth to groundwater varies from 30 to over 200 ft below ground surface. Transmissivity estimates range from 56,000 to 126,000 gpd/ft, and the coefficient of storage has been estimated at 0.0022. Production from public supply and irrigation well yields range from 200 to 1,500 gpm, although most other wells generally yield less than 100 gpm. The average well yield from all types of wells is about 65 gpm.

The aquifer consists of a sequence of limestone and dolomite that crop out in a circular pattern around the Llano Uplift and dip radially into the subsurface away from the center of the uplift to depths of approximately 3,000 ft. Outcrop of the aquifer within GMA-9 is limited to Blanco County, with subcrop extending into northern Kendall County and eastern Kerr County. The maximum thickness of the aquifer is about 2,700 ft. Water is held in fractures, cavities, and solution channels and is commonly under confined conditions. The aquifer is highly permeable in places, as indicated by wells that yield as much as 1,000 gpm and springs that issue from the aquifer, maintaining the base flow of streams in the area.

Below is a summary of the current GMA 7 and 8 DFCs for the Ellenburger-San Saba Aquifer.

<u>GMA 7 DFCs for the Ellenburger-San Saba Aquifer (July 29, 2010)</u> –

- Total net decline in water levels within the Hickory UWCD No. 1, Hill Country UWCD, Kimble County GCD, and Menard County Underground Water District (UWD) at the end of the fifty-year period shall not exceed 5 ft below 2010 water levels in the aquifer.

<u>GMA 8 DFCs for the Ellenburger-San Saba Aquifer (May 19, 2008)</u> –

- Burnet County should maintain approximately 100 percentage of the saturated thickness after 50 years by using approximately 80 percent of the estimated recharge.
- Lampasas County should maintain approximately 90 percent of the saturated thickness after 50 years.
- Brown and Mills counties should maintain approximately 90 percent of the available drawn down after 50 years.

Groundwater Demands

Most of the groundwater in the Ellenburger-San Saba Aquifer is used for municipal purposes, and the remainder for irrigation and livestock. The aquifer is used by the City of Johnson City, and many domestic and livestock users in that part of Blanco County. A large portion of water flowing from San Saba Springs, which is the water supply for the City of San Saba (outside of the GMA-9 boundaries), is thought to be from the Ellenburger-San Saba and Marble Falls aquifers.

Current Groundwater Uses/TERS

Table 21 presents the TERS volume estimates calculated by the TWDB for the Ellenburger-San Saba Aquifer.

Table 21. Ellenburger-San Saba Aquifer – Total Estimated Recoverable Storage Amounts within GMA-9 (by Groundwater Conservation District)

GMA-9 GCD	Total Storage (ac-ft)	25% of Total Storage (ac-ft)	75% of Total Storage (ac-ft)
BPGCD	8,300,000	2,075,000	6,225,000
CCGCD	3,500,000	875,000	2,625,000
HGCD	2,100,000	525,000	1,575,000
Totals	**13,900,000**	**3,475,000**	**10,425,000**

Source: Jones and Bradley, 2013

Table 22 contains numbers from the TWDB water use database. Counties that are not listed were not listed with use from the aquifer. Year 2013 was the most recent year of available data. All user counties are included in the following table for general reference, even if they are not within GMA-9.

Table 22. Ellenburger-San Saba Aquifer 2013 Groundwater Use (by GMA-9 County)

GMA-9 County	Type of Use and Estimated Use Amounts for 2013 (in ac-ft)						
	Municipal	Manufacturing	Mining	Steam Electric Power	Irrigation	Livestock	Totals
Blanco	214	0	0	0	1,065	60	**1,339**
Totals	**214**	**0**	**0**	**0**	**1,065**	**60**	**1,339**

Source: TWDB Water Use Survey Team, Historical Groundwater Pumping Estimates

TWDB recently derived exempt use estimates based on 2010 Census Data, TWDB population projections, TWDB Water Use Survey data, TWDB water demand projections, and the TWDB water well database. The exempt use estimates are shown below in **Table 23**.

Table 23. Ellenburger-San Saba Aquifer Estimated Exempt Use (by GMA-9 Groundwater Conservation District)

GMA-9 GCD	Estimated Exempt Use by Year (in ac-ft)						
	2015	2020	2030	2040	2050	2060	2070
BPGCD	285	316	353	379	393	402	407
Estimated Exempt Use Totals	**285**	**316**	**353**	**379**	**393**	**402**	**407**

Source: TWDB Projected Exempt Groundwater Use Estimates, GMA-9, December 2015

Based on these estimates, primary use of the Ellenburger-San Saba Aquifer in GMA-9 is for irrigation in Blanco County. Annually, about 285 ac-ft is pumped for exempt uses.

Conclusions Regarding Non-Impacts to Adjacent or Connected Aquifers

Due to minimal current pumping and geological and hydrogeological characteristics, none of the production from the Ellenburger-San Saba Aquifer has any effect on other GCDs within GMA-9.

5.2.1.3 Ellenburger-San Saba Aquifer as Non-Relevant for Joint Planning Purposes within GMA-9

The following is an explanation of why GMA-9 is proposing to classify the Ellenburger-San Saba Aquifer as non-relevant for the purposes of joint planning in those portions of Blanco and Kerr counties within GMA-9.

The TWDB calculated the following potential MAG volumes for this aquifer in GMA-9 during the first round of joint planning: Blanco – 2,661 ac-ft; Kendall – 9 ac-ft; and Kerr – 6 ac-ft. GMA-9 has adopted a DFC for Kendall County. The aquifer does not extend into Bandera, Medina, Bexar, Comal, Hays or Travis counties.

GMA-9 is proposing to classify the Ellenburger-San Saba Aquifer as non-relevant for the purposes of joint planning in Blanco and Kerr counties for the following reasons:

- There is no known production of groundwater from the Ellenburger-San Saba Aquifer in Kendall or Kerr County. This aquifer involves such small quantities and at such great depths that it is not economically viable or likely to be developed in either of these two counties.
- Blanco County is the only county in GMA-9 with manageable quantities of Ellenburger-San Saba groundwater production, and that is only in the northwestern portion of Blanco County.
- The largest Ellenburger-San Saba Aquifer permitted well system (only 150 ac-ft per year) in Blanco County is owned by Johnson City, and this public water supply system is already regulated by both the TCEQ and the BPGCD. Except for a few small-volume permitted wells, the rest of Ellenburger-San Saba production is from exempt domestic and/or livestock watering wells.
- Due to geological and hydrogeological characteristics, none of the production from the Ellenburger-San Saba Aquifer has any effect on other GCDs within GMA-9, and classifying the

Ellenburger-San Saba Aquifer as non-relevant in Blanco and Kerr counties will have no significant impact on surrounding entities or the joint planning process.

- The Ellenburger-San Saba Aquifer will continue to be managed locally by the individual GCDs that have jurisdiction.

GMA-9 determined that the aquifer characteristics, groundwater demands, and current groundwater uses for that portion of the Ellenburger-San Saba Aquifer located in GMA-9 do not warrant adopting a DFC. Therefore, GMA-9 is proposing that portions of this aquifer located within its boundaries, specifically in parts of Blanco and Kerr counties, be classified as non-relevant for joint planning purposes.

5.2.2 Hickory Aquifer

GMA-9 is proposing to classify the Hickory Aquifer located within Blanco, Hays, Kerr, and Travis counties within the GMA-9 boundaries as non-relevant for the purposes of joint planning. This proposed classification does not impact the BPGCD's authority or ability to manage that portion of the Hickory Aquifer in Blanco County, the HTGCD's authority or ability to manage that portion of the Hickory Aquifer in Hays County, the HGCD's authority or ability to manage that portion of the aquifer in Kerr County, or the BSEACD's ability or authority as it relates to the aquifer located in Hays and Travis counties, as these portions of this aquifer remain within these GCDs' jurisdictional boundaries and continue to be subject to their enabling statutes, rules, management plans, and programs.

5.2.2.1 Aquifer Portion Description, Location, and Map

The following describes the portion of the Hickory Aquifer that GMA-9 is proposing to classify as non-relevant.

The Hickory Aquifer is a minor aquifer found in the central part of the State, consisting of the water-bearing parts of the Hickory Sandstone Member of the Riley Formation. Total area of outcrop for the aquifer is 271 square miles, with an 8,193 square mile subsurface area. Nineteen Texas counties contain portions of the aquifer, with 85 percent of the aquifer located within a GCD. Within GMA-9, the Hickory is located within the BPGCD, BSEACD, CCGCD, HTGCD, and HGCD. The total area of the aquifer within GMA-9 is 1,056,750 acres; the outcrop area is 11,597 acres, or one percent of the total area.

The proposed non-relevant portions of the Hickory Aquifer within GMA-9 are shown in **Figure 17**.

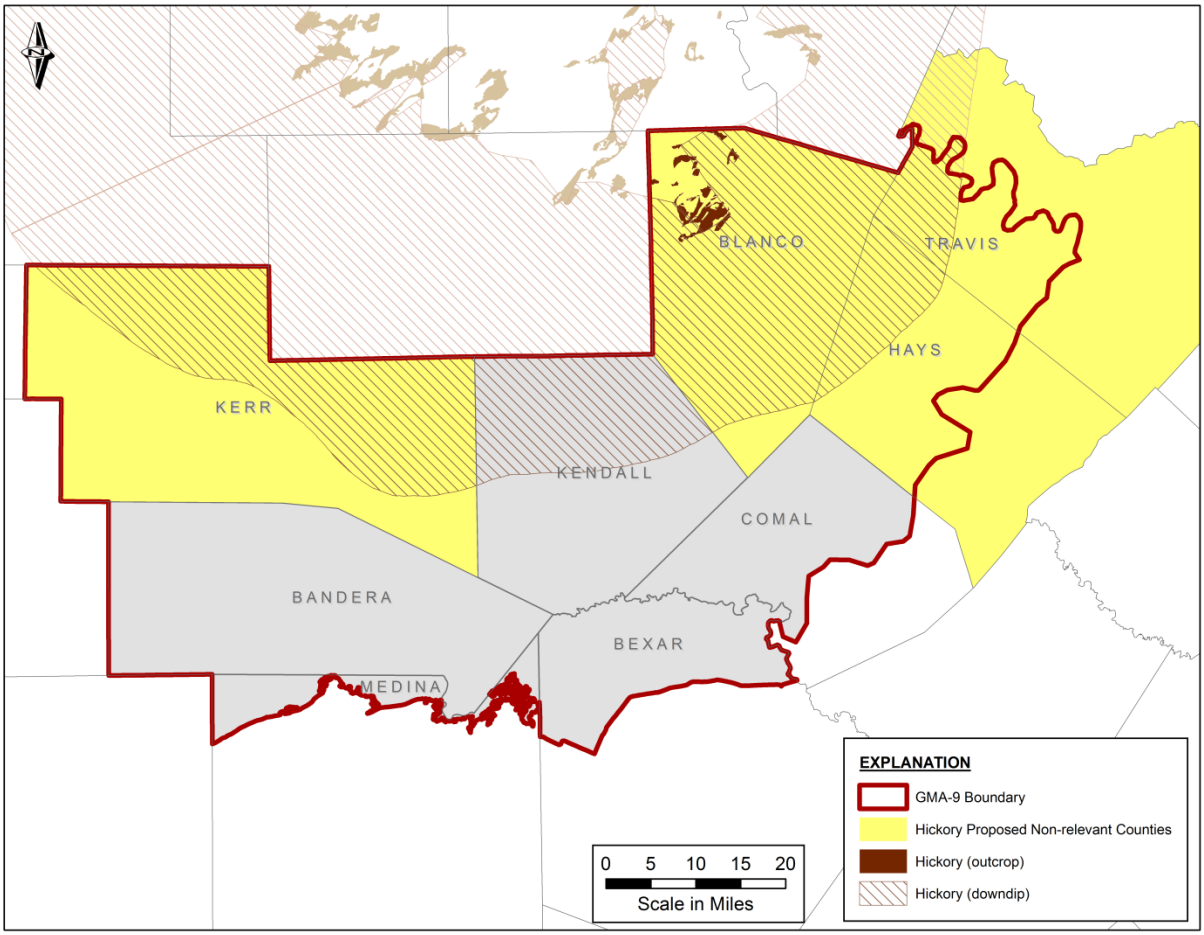

Figure 17. Proposed non-relevant portions of Hickory Aquifer within GMA-9.

5.2.2.2 Aquifer Characteristics, Groundwater Demands, Current Groundwater Uses, Including Total Estimated Recoverable Storage (TERS)

The following describes the aquifer characteristics, groundwater demands, and current groundwater uses, including the TERS amounts, for the portion of the Hickory Aquifer that GMA-9 is proposing to classify as non-relevant that support the conclusion that DFCs in adjacent or hydraulically connected relevant aquifer(s) will not be affected.

Characteristics, including other GMA DFCs for the aquifer

The Hickory Aquifer is a Cambrian age sandstone aquifer that occurs in 19 counties in the Llano Uplift region of central Texas. Most of the water currently pumped from the Hickory is used for irrigation and livestock purposes, with a smaller amount used for municipal supply purposes. Most of the pumpage from the Hickory occurs in Mason County, where almost all is used for irrigation.

The Hickory Sandstone is located around the exposed Precambrian rocks that form the Llano Uplift. Outcrops of the Hickory are discontinuous, and block faulting has compartmentalized much of the Hickory

aquifer, and these restrict groundwater flow in some areas. The downdip, confined portion of the aquifer encircles the uplift and extends to maximum depths greater than 4,500 ft.

Groundwater in the Hickory Aquifer occurs under both water table and artesian conditions. Groundwater is generally found under water table conditions in the outcrop area, and under artesian conditions downdip. A majority of the groundwater production occurs in the outcrop area. Transmissivity estimates range from 5,000 to over 40,000 gallons/per day/foot (gpd/ft) and confined storage values range from 0.0001 to 0.00004. Yields of large-capacity wells usually range between 200 and 500 gpm, although some wells have yields in excess of 1,000 gpm. The highest well yields are typically found northwest of the Llano Uplift, where the aquifer has the greatest saturated thickness. The depth to groundwater in the Hickory Aquifer varies from 10 to over 300 ft below ground surface, and typical well depths near the Hickory outcrop area range from 50 to 200 ft, but can be as deep as 2,000 to 5,000 ft deep at the outer downdip extents of the aquifer.

Recharge to the Hickory Aquifer is from the infiltration of precipitation on the outcrop and from the downward leakage from the overlying Trinity Aquifer. Average effective recharge from precipitation is estimated to be 2.7 percent of annual precipitation and is only applied to outcrop areas. The amount of recharge from the Trinity is unknown. Groundwater flow is from the recharge areas to downdip areas. Exact groundwater flow directions and rates are not known due to the lack of available data and the complexity of the system. However, in general, groundwater flows radially downdip away from the central part of the Llano Uplift. Discharge from the Hickory is to wells and through cross-formational leakage to overlying units.

The Hickory Aquifer is comprised of sandstone with outcrop found in northwestern Blanco County and subcrop in western Hays County, western Travis County, northern Kendall County, and north and eastern Kerr County.

Exposures are highly irregular in shape, due to both faulting and overlapping by rocks of Cretaceous age. This aquifer dips predominantly southeastward from the outcrop areas at angles of about 10 degrees in some areas. The Hickory yields low to moderate quantities of water. Well drillers have reported new wells producing up to 30 gpm. Recharge to the Hickory occurs from local precipitation on its outcrop and through the overlying units, where it is in the subsurface.

The extent of the Hickory in Hays County is defined by an interpretation of the Ouachita Fold Belt thrust front and the Ouachita Facies (Flawn et al., 1961). The Hickory Aquifer within the HTGCD is limited to the Paleozoic Foreland Facies within the western edge of Hays County.

Below is a summary of the current GMA 7 and 8 DFCs for the Hickory Aquifer.

<u>GMA 7 DFCs for the Hickory (July 29, 2010)</u> –

- Total net decline in water levels within the Hickory UWCD No. 1, Hill Country UWCD, Kimble County GCD, and Menard County UWD, Llano County, and the unprotected areas in McCulloch and San Saba counties at the end of the fifty-year period shall not exceed seven (7) ft below 2010 water levels in the aquifer.

GMA 8 DFCs for the Hickory (May 12, 2008) –

- Burnett County pumping should maintain approximately 100 percent of the saturated thickness after 50 years by using approximately 80 percent of the estimated recharge.
- Brown, Lampasas, Mills, Travis, and Williamson counties should maintain approximately 90 percent of the available draw down after 50 years.

Groundwater Demands

Groundwater is used for irrigation throughout the extent of the Hickory Aquifer and for municipal supply in the cities of Brady, Mason, and Fredericksburg (outside of GMA-9).

Water demand in western Hays County is primarily for residential use and ranching. There is little agriculture or high-volume commercial use. There are no large water supply companies. This rural demand is met by Middle Trinity Aquifer wells producing from the Lower Glen Rose and the Cow Creek formations.

There are currently no known drilled wells in the Hickory Aquifer in Kerr County. Therefore, there is no historic pumping or aquifer level drawdown data.

Current Groundwater Uses/TERS

Table 24 presents the TERS volume estimates calculated by the TWDB for the Hickory Aquifer.

Table 24. Hickory Aquifer – Total Estimated Recoverable Storage Amounts within GMA-9 (by Groundwater Conservation District)

GMA-9 GCD	Total Storage (ac-ft)	25% of Total Storage (ac-ft)	75% of Total Storage (ac-ft)
No GCD	24,000	6,000	18,000
BPGCD	4,700,000	1,175,000	3,525,000
CCGCD	2,100,000	525,000	1,575,000
HTGCD	58,000	14,500	43,500
HGCD	4,700,000	1,175,000	3,525,000
Totals	**11,582,000**	**2,895,500**	**8,686,500**

Source: Jones and Bradley, 2013

The following numbers (**Table 25**) are from the TWDB water use database. Counties that are not listed were not listed with use from the aquifer. Year 2013 was the most recent year of available data. All user counties are included in the following table for general reference, even if they are not within GMA-9.

Table 25. Hickory Aquifer 2013 Groundwater Use (by GMA-9 County)

GMA-9 County	Type of Use and Estimated Use Amounts for 2013 (in ac-ft)						
	Municipal	Manufacturing	Mining	Steam Electric Power	Irrigation	Livestock	Totals
Blanco	65	0	0	0	213	23	**301**
Totals	**65**	**0**	**0**	**0**	**213**	**23**	**301**

Source: TWDB Water Use Survey Team, Historical Groundwater Pumping Estimates

TWDB recently derived exempt use estimates based on 2010 Census Data, TWDB population projections, TWDB Water Use Survey data, TWDB water demand projections, and the TWDB water well database. The exempt use estimates (**Table 26**) are as follows:

Table 26. Hickory Aquifer Estimated Exempt Use (by GMA-9 Groundwater Conservation District)

GMA-9 GCD	Estimated Exempt Use by Year (in ac-ft)						
	2015	2020	2030	2040	2050	2060	2070
BPGCD	90	100	111	119	123	125	127
Estimated Exempt Use Totals	**90**	**100**	**111**	**119**	**123**	**125**	**127**

Source: TWDB Projected Exempt Groundwater Use Estimates, GMA-9, December 2015

According to TWDB water use estimates, the greatest amount of recent pumping from the Hickory Aquifer in GMA-9 is for irrigation in Blanco County. Exempt use pumping is about 90 ac-ft annually.

To date, there is no known water production from Paleozoic rocks in Hays County. Pre-Cretaceous (geologic picks from geophysical log correlations) cuttings samples examined from water wells drilled within the HTGCD all appear to be semi-metamorphosed, Ouachita Facies. The Harwell No.1 well (Shell) drilled in Hays County (1956) spudded in the Trinity and encountered Pennsylvanian shale at 820'. The well TD was 4661' in limestone and dolomite. No fresh water was reported and the well bottomed in the Paleozoic Foreland Facies.

Conclusions Regarding Non-Impacts to Adjacent or Connected Aquifers

Due to geological and hydrogeological characteristics, none of the production from the Hickory Aquifer has any effect on other GCDs within GMA-9.

5.2.2.3 Hickory Aquifer as Non-Relevant for Joint Planning Purposes within GMA-9

The following is an explanation of why GMA-9 is proposing to classify the Hickory Aquifer as non-relevant for the purposes of joint planning in those portions of Blanco and Kerr counties within GMA-9.

The TWDB calculated the following MAG volumes for this aquifer in GMA-9 during the first round of joint planning: Blanco County – 1,163 ac-ft; Kendall County – 2 ac-ft, Kerr County – 4 ac-ft, and Hays County – 1 ac-ft. GMA-9 has elected to set a DFC for Kendall County. The aquifer does not extend into Bandera, Medina, Bexar, or Comal counties.

GMA-9 is proposing to classify the Hickory Aquifer as non-relevant for the purposes of joint planning in Blanco, Hays, Kerr and Travis counties for the following reasons:

- There is no known production of groundwater from the Hickory Aquifer in Hays, Kendall or Kerr counties. This aquifer involves such small quantities and at such great depths that it is not economically viable or likely to be developed in either of these three counties.
- Blanco County is the only county in GMA-9 with manageable quantities of Hickory groundwater production, and that is only in the northwestern portion of Blanco County.

- Hays County has no known water production from Paleozoic rocks, and no subsurface verification of assumptions regarding the aquifer properties of the Hickory exist that can substantiate even one ac-ft of recoverable groundwater from the Hickory Aquifer in Hays County.
- With no Hickory encountered in the subsurface and no Paleozoic groundwater production in western Hays County, this aquifer has not been included in planning by the HTGCD.
- Production from Hickory Aquifer wells in Blanco County is almost all for exempt use. There are a few non-exempt wells that pump into ranch ponds, and even those are generally located on large ranch tracts and have little or no off-site effects.
- Due to geological and hydrogeological characteristics, none of the production from the Hickory Aquifer has any effect on other groundwater districts within GMA-9, and with the uncertainty regarding water quality in portions of Blanco, Hays, Kerr and Travis counties, classifying the Hickory Aquifer as non-relevant in these counties will have no impact on surrounding entities or the joint planning process.
- The Hickory Aquifer will continue to be managed locally by the individual GCDs that have jurisdiction.

GMA-9 determined that the aquifer characteristics, groundwater demands, and current groundwater uses for that portion of the Hickory Aquifer located in GMA-9 do not warrant adopting a DFC. Therefore, GMA-9 is proposing that this aquifer located within its boundaries, specifically in parts of Blanco, Hays, Kerr and Travis counties, be classified as non-relevant for joint planning purposes.

5.2.3 Marble Falls Aquifer

GMA-9 is proposing to classify the Marble Falls Aquifer located within Blanco County within the GMA-9 boundaries as non-relevant for the purposes of joint planning. This proposed classification does not impact the BPGCD's authority or ability to manage this aquifer in Blanco County as it remains within this GCD's jurisdictional boundaries and continues to be subject to its enabling statutes, rules, management plans, and programs.

5.2.3.1 Aquifer Portion Description, Location and Map

The following describes the portion of the Marble Falls Aquifer that GMA-9 is proposing to classify as non-relevant.

The Marble Falls Aquifer is a minor aquifer, occurring in several separated outcrops along the northern and eastern flanks of the Llano Uplift region of central Texas. The subsurface extent of the aquifer is unknown. Eight Texas counties contain portions of the aquifer, with 78 percent of the aquifer located within GCDs. Within GMA-9, the Marble Falls Aquifer is located within the BPGCD. The total area of the aquifer is 214 square miles, 1,923 acres of which is located within GMA-9 (all of this is outcrop area).

The proposed non-relevant portions of the Marble Falls Aquifer within GMA-9 are depicted in **Figure 18**.

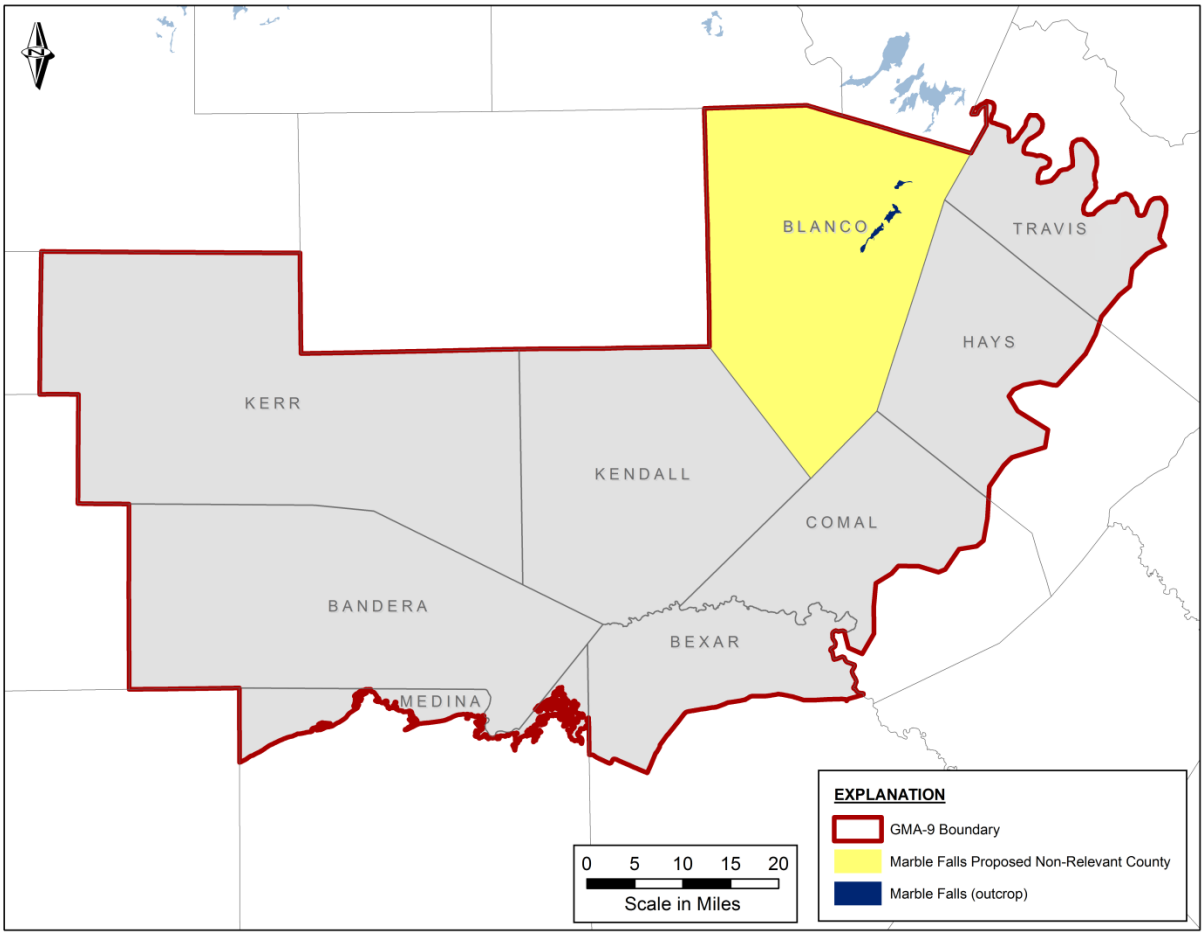

Figure 18. Proposed non-relevant portions of Marble Falls Aquifer within GMA-9.

5.2.3.2 Aquifer Characteristics, Groundwater Demands, Current Groundwater Uses, Including Total Estimated Recoverable Storage (TERS)

The following describes the aquifer characteristics, groundwater demands, and current groundwater uses, including the TERS amounts, for the portion of the Marble Falls Aquifer that GMA-9 is proposing to classify as non-relevant that support the conclusion that DFCs in adjacent or hydraulically connected relevant aquifer(s) will not be affected.

Characteristics, including other GMA DFCs for the aquifer

The Marble Falls Aquifer occurs in eight counties in the Llano Uplift area in central Texas. Groundwater from the Marble Falls Aquifer is currently used mostly for livestock purposes, although small amounts are also used for municipal purposes. The towns of San Saba and Rochelle are the two largest communities that have historically withdrawn groundwater from the Marble Falls Aquifer for public supply use. Most of the production from the Marble Falls Aquifer occurs in Mason County.

The Marble Falls Formation is a Pennsylvanian age, fine-grained, thinly to thickly bedded limestone, with some interbedded shale. It occurs in several separate outcrops, primarily along the northern and eastern

flanks of the Llano Uplift region. The Marble Falls Formation is up to 600 ft thick, although the downdip extent of the aquifer is unknown.

Recharge to the Marble Falls Aquifer is from precipitation on the outcrop areas. Average effective recharge from precipitation is estimated to be 5 percent of annual precipitation based on spring flow data, and is estimated to be 261 ac-ft per year in GMA-9. Discharge is mainly to numerous large springs emanating from the aquifer, and to wells. Groundwater flow is generally from the outcrop areas in a downdip direction. Groundwater occurs in solution cavities that have formed along fractures and faults in the limestone. Where underlying beds are thin or absent, the Marble Falls and Ellenburger-San Saba aquifers may be hydrologically connected. The aquifer is capable of producing small to moderate quantities of water to wells, with well yields increasing significantly with acidizing. Wells completed in the Marble Falls Aquifer generally produce less than 100 gpm, although some irrigation wells have been reported to produce as much as 200 gpm. Very few data exist on the overall aquifer characteristics of the Marble Falls Aquifer.

Groundwater occurs in fractures, solution cavities, and channels in the limestone of the Marble Falls Formation of the Bend Group. The aquifer is highly permeable in places, as indicated by wells that yield as much as 2,000 gpm. Maximum thickness of the formation is 600 ft. Numerous large springs issue from the aquifer and provide a significant part of the base flow to the San Saba River in McCulloch and San Saba counties, and to the Colorado River in San Saba and Lampasas counties.

Below is a summary of current GMA 7 and 8 DFCs for the Marble Falls Aquifer.

GMA 7 DFCs for the Marble Falls Aquifer (July 29, 2010) –

- Total net decline in water levels in San Saba County at the end of the fifty-year period shall not exceed seven (7) ft below 2010 water levels in the aquifer.

GMA 8 DFCs for the Marble Falls Aquifer (May 19, 2008) –

- Burnet County should maintain approximately 100 percent of the saturated thickness after 50 years by using approximately 80 percent of the estimated recharge.
- Lampasas County should maintain approximately 90 percent of the saturated thickness after 50 years.

Groundwater Demands

Water from the Marble Falls Aquifer is used for municipal, agricultural, and industrial uses, and no significant water level declines have occurred in wells measured by the TWDB.

Current Groundwater Uses/TERS

Table 27 presents the TERS volume estimates calculated by the TWDB for the Marble Falls Aquifer.

Table 27. Marble Falls Aquifer – Total Estimated Recoverable Storage Amounts within GMA-9 (by Groundwater Conservation District)

GMA-9 GCD	Total Storage (ac-ft)	25% of Total Storage (ac-ft)	75% of Total Storage (ac-ft)
BPGCD	1,300	325	975
Totals	**1,300**	**325**	**975**

Source: Jones and Bradley, 2013

The following numbers (**Table 28**) are from the TWDB water use database. Year 2013 was the most recent year of available data. All user counties are included in the following table for general reference, even if they are not within GMA-9.

Table 28. Marble Falls Aquifer 2013 Groundwater Use (by GMA-9 County)

GMA-9 County	Type of Use and Estimated Use Amounts for 2013 (in ac-ft)						
	Municipal	Manufacturing	Mining	Steam Electric Power	Irrigation	Livestock	Totals
Blanco	7	0	0	0	0	1	**8**
Totals	**7**	**0**	**0**	**0**	**0**	**1**	**8**

Source: TWDB Water Use Survey Team, Historical Groundwater Pumping Estimates

TWDB recently derived exempt use estimates based on 2010 Census Data, TWDB population projections, TWDB Water Use Survey data, TWDB water demand projections, and the TWDB water well database. The exempt use estimates (**Table 29**) are as follows:

Table 29. Marble Falls Aquifer Estimated Exempt Use (by GMA-9 Groundwater Conservation District)

GMA-9 GCD	Estimated Exempt Use by Year (in ac-ft)						
	2015	2020	2030	2040	2050	2060	2070
BPGCD	8	8	9	10	11	11	11
Estimated Exempt Use Totals	**8**	**8**	**9**	**10**	**11**	**11**	**11**

Source: TWDB Projected Exempt Groundwater Use Estimates, GMA-9, December 2015

The primary use of groundwater pumped recently from the Marble Falls Aquifer in GMA-9 was for municipal use. Approximately eight ac-ft annually was pumped for exempt uses.

Conclusions Regarding Non-Impacts to Adjacent or Connected Aquifers

Due to limited aerial extent, minimal groundwater pumping and geological and hydrogeological characteristics, none of the production from the Marble Falls Aquifer has any effect on other GCDs within GMA-9.

5.2.3.3 Marble Falls Aquifer as Non-Relevant for Joint Planning Purposes within GMA-9

The TWDB calculated a MAG volume for Blanco County of 261 ac-ft as a result of the DFC set by GMA-9 in first round of joint planning. The aquifer does not extend into any other county within GMA-9.

GMA-9 is proposing to classify the Marble Falls Aquifer as non-relevant for the purposes of joint planning in Blanco County for the following reasons:

- Blanco County has less than a dozen wells producing from the Marble Falls Aquifer, and those are all exempt wells.
- Due to geological and hydrogeological characteristics, none of the production from the Marble Falls Aquifer has any effect on other groundwater districts within GMA-9, and classifying the Marble Falls Aquifer as non-relevant for the purposes of joint planning in Blanco County, as well as all other GMA-9 counties, will have no effect on current water users, other GCDs, or other entities involved in the joint planning process.
- The Marble Falls Aquifer will continue to be managed locally by the BPGCD that has jurisdiction.

In summary, GMA-9 determined that the aquifer characteristics, groundwater demands, and current groundwater uses for that portion of the Marble Falls Aquifer located in GMA-9 do not warrant adopting a DFC. Therefore, GMA-9 is proposing that this aquifer located within its boundaries, specifically in Blanco County, be classified as non-relevant for joint planning purposes.

6.0 GMA-9-DESIRED FUTURE CONDITIONS

On April 18, 2016, GMA-9 adopted the following DFC statements for certain major and minor aquifers within the GMA-9 boundaries summarized in **Table 30**:

Table 30. GMA-9 Adopted Desired Future Conditions (Major and Minor Aquifers)

MAJOR OR MINOR AQUIFER	DESIRED FUTURE CONDITION
Trinity	Allow For An Increase in Average Drawdown of Approximately 30 Feet Through 2060 (throughout GMA-9) Consistent With "Scenario 6" in TWDB GAM Task 10-005
Edwards Group of Edwards-Trinity (Plateau)	Allow For No Net Increase in Average Drawdown in Bandera and Kendall Counties Through 2070
Ellenburger-San Saba	Allow For An Increase in Average Drawdown of No More Than 2 Feet in Kendall County Through 2070
Hickory	Allow For An Increase in Average Drawdown of No More Than 7 Feet in Kendall County Through 2070

The following is a discussion of GMA-9's policy and technical justifications for these four DFCs, how these DFC satisfy the "balance test" outlined in Subsection 36.108 (d-2) of the TWC, discussion of the nine factors set out in Section 36.108 (d) of the TWC, other DFCs that may have been considered by GMA-9, and a discussion of other recommendations offered in relevant public comments and GMA-9's response to those recommendations. The following discussion of the four DFCs is divided into the two DFCs for the major aquifers in GMA-9, and the two DFCs for the minor aquifers in GMA-9. The discussion also reflects information used to prepare the September 28, 2015 presentation and other supplemental information.

6.1 Major Aquifers: Trinity Aquifer Desired Future Condition - Throughout GMA-9, and Edwards Group of the Edwards-Trinity (Plateau) Aquifer Desired Future Condition – Bandera and Kendall Counties Only

The DFCs stated above in **Table 30** for the Trinity Aquifer and the Edwards Group of the Edwards-Trinity (Plateau) Aquifer are the same ones GMA-9 adopted for these major aquifers on July 26, 2010, during the first round of joint planning. GMA-9 is also proposing to classify portions of the Edwards Group of the Edwards-Trinity (Plateau) Aquifer as non-relevant for the purposes of joint planning in Blanco and Kerr counties, as discussed previously under **Chapter 5.0** – GMA-9 PROPOSED NON-RELEVANT AQUIFER CLASSIFICATIONS.

6.1.1 Policy and Technical Justifications – Trinity Aquifer

The following discussion sets out GMA-9's policy and technical justifications in the second round of joint planning for the above-stated Trinity Aquifer DFC (**Table 30**), GMA-9's policy and technical justifications during the first joint planning round, and how the adopted DFC for the Trinity Aquifer achieves the "balance test" described in Subsection 36.108 (d-2) of the TWC.

6.1.1.1 Second-Round of Joint Planning

The DFC set by GMA-9 for the Trinity Aquifer in July 2010 was based on a long-term target (50-year time period). During the initial five-year period since the DFC was adopted (2010-2015), the GCDs were in the

early stages of assessing the water level changes that occurred in the last five years, and gathering and reviewing other data and information related to implementing the DFC, such as comparing actual groundwater use to the MAG amounts for this aquifer. In the fall of 2012 GMA-9 retained Dr. William Hutchison, Ph.D., P.E., P.G., Independent Groundwater Consultant, and James Beach, P.G., LBG-Guyton Associates, to compare actual groundwater level data with groundwater model predictions, on a well-by-well basis, that were developed during the process to consider the first Trinity Aquifer DFC set by GMA-9. The members of GMA-9 decided to conduct this analysis to refine how the model results relate to actual water level data, and how these two data sets could be considered in future joint planning efforts.

The report was completed in February 2014 with the publication of the final report titled *A Comparison of Groundwater Monitoring Data with Groundwater Model Results Groundwater Management Area 9*. The analysis showed there were differences between simulated and actual groundwater elevations throughout the area, and the actual groundwater elevations were higher than the simulated groundwater elevations in some locations, and lower than the simulated groundwater elevations in other locations. Some of the differences were attributed to the relative assumptions of wet years and dry years in the overall DFC estimates. However, comparing individual model scenarios that had similar rainfall and recharge conditions from 2009 to 2011 also had simulated groundwater elevations that were higher than actual groundwater elevations. This difference was attributed to apparent differences in actual pumping and the pumping assumed in the DFC simulations.

Severe drought conditions have prevailed for most of the five-year period since the DFC was originally adopted, and the members of GMA-9 determined it is more beneficial to assess the DFC over a longer time period, and should the region return to a more normal or average weather pattern. The members of GMA-9 hope to work with the TWDB on updating the HCT GAM, which has not been updated since 2009, early in the third joint planning cycle so they can conduct new model runs and consider this, and other, technical data as they contemplate developing and possibly setting a new DFC or new DFCs, as applicable. These two elements combined will enable the GCDs in GMA-9 to develop and implement a practical and cost-efficient methodology for reviewing and refining new DFC(s) based on sufficient and relevant data gathered over a longer, more representative period of time, and to use the best available science to support the DFC decision(s) to ensure they are reasonable and achievable. Even with the model update, it is important to remember that the HCT GAM is a regional model, and is not intended to be used as a tool for local predictive modeling.

6.1.1.2 First-Round of Joint Planning

During the first round of joint planning, GMA-9 undertook detailed consideration of DFCs and non-relevant aquifer classifications that subsequently supported the second round of planning. Therefore, a summary of the first round of DFC adoptions is included as part of this ER.

On July 26, 2010, GMA-9 adopted the following DFC for the Trinity Aquifer - "Allow for an increase in average drawdown of approximately 30 feet through 2060 consistent with Scenario 6 in TWDB Draft GAM Task 10-005." At that same time, GMA-9 adopted a DFC for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer in Kendall and Bandera counties and declared the Edwards Group of the Edwards-Trinity

(Plateau) Aquifer to be "not relevant" in Kerr and Blanco counties. GMA-9 officially submitted notice of these actions to the TWDB on August 26, 2010 (GMA-9, 2010b). Although two petitions were subsequently filed in 2011 challenging the reasonableness of GMA-9's Trinity Aquifer DFC, the TWDB determined that the adopted DFC was reasonable. Copies of the GMA-9 August 26, 2010 letter to the TWDB, and GMA-9's prepared response for the TWDB hearing held on November 16, 2011, are on file in the GMA-9 files maintained in the BPGCD offices.

The policy and technical justifications originally stated in the both of these documents are still applicable during this second round of GMA-9 joint planning. Highlights from both documents are summarized below.

GMA-9 used a methodical process during the first round of joint planning, as discussed previously **Chapter 4.0 –** GMA-9 JOINT PLANNING AND DESIRED FUTURE CONDITION DEVELOPMENT PROCESS, of this ER. In addition to discussing the process and information they used to develop, consider and ultimately approve the Trinity Aquifer DFC, in the November 16, 2011 hearing response before the TWDB, GMA-9 members pointed out that the Committee developed the adopted Trinity Aquifer DFC according to the guidelines and laws governing the process, and attempted to set a DFC that *"...provides a balance between the highest practicable level of groundwater production and the conservation, preservation, protection, recharging, and prevention of waste of groundwater in the management area,"*(GMA-9, 2011b, p. 2). In so doing, GMA-9 re-iterated their commitment to the goal of striking an equitable balance between all stakeholders and each of the areas in GMA-9.

GMA-9 determined that, consistent with stakeholder input, the most appropriate way to preserve base flow was to protect the primary source water (e.g. spring flow). Because the primary threat to spring flow was increased pumping, GMA-9 decided it was *"prudent, conservative and appropriate to set a DFC that would meet current demand, projected exempt demands, and have a bit left over for non-exempt use,"* (GMA-9, 2011b, p. 7).

After many public meetings and discussions, GMA-9 elected to set a DFC expressed as a regional average 30-ft drawdown, which was not the largest decline discussed and considered by the group. The DFC was established because it was the "best fit" to provide for current demands, a reasonable accommodation for projected future demands, and impact creek and spring flow as little as possible. Based on the model runs and best available data, GMA-9 believed that a DFC based on a decrease in drawdown may be unachievable and not reasonable because it would not likely provide sufficient water for current and projected demands.

With the majority of current and future pumping produced from exempt wells, the Trinity Aquifer DFC both acknowledged the effects of exempt pumping and allowed for some level of reasonable pumping from non-exempt wells. This was the type of consensus yield (and resulting impacts) that GMA-9 was striving to achieve when they adopted the DFC.

The DFC was an attempt to strike a balance and consensus among the GCDs. GMA-9 would continue to review the DFC expression, along with its geographic extent, as more information and management strategies were developed to further refine both. Lastly, GMA-9 noted the group was developing a regional monitoring network to collect data and observe water level changes resulting from pumping and climatic

variations. The data would be invaluable in the refinement, monitoring and long-term management of the Trinity Aquifer.

GMA-9 selected the Trinity Aquifer DFC for the benefit of the entire region, as well as the good of the local GCDs and counties. Under the new requirements of GMA and DFC planning set by the Texas Legislature in 2011, the DFC approved by GMA-9 for the Trinity Aquifer even met the latest mandate to *"provide a balance between the highest practicable level of groundwater production and the conservation, preservation, protection, recharging, and prevention of waste of groundwater in the management area,"* (TWC §36.108 (d-2), p. 50).

There were other policy and technical considerations that factored into GMA-9's July 26, 2010 Trinity Aquifer DFC decision. The DFC that GMA-9 approved would yield a MAG amount wherein each GCD and each county would be provided with a specific drawdown for each subdivision of the Trinity Aquifer essentially resulting in individual DFCs, and pumpage calculations for the Trinity Aquifer as a whole. This was one of the reasons GMA-9 designated the DFC as it did, referencing Scenario 6 in TWDB Draft GAM Task 10-005 (Hutchison, 2010). The local GCDs would then be able to develop rules and GMPs that could address local pumping demands for each subdivision of the Trinity or any designated hydrogeological unit or area. Keeping the entire MAG amount in a total "Trinity Aquifer" classification would allow the GCDs more flexibility in developing management strategies for the groundwater in each individual Trinity Aquifer subdivision.

GMA-9 also considered the DOR and with the assistance of the TWDB, conducted a large number of trial GAM runs, many of which included DOR conditions. In every case where GMA-9 attempted to incorporate DOR conditions, the model yielded either unusable or impractical results because the DOR skewed them dramatically and would require setting a DFC with a very high drawdown in order to meet current demands during the DOR, or it failed to function due to an excessive number of dry model cells. During this process, therefore, GMA-9 determined that the DOR could not be incorporated into the current predictive models. Given the limitations of the modeling, GMA-9 determined that a reasonable approach was to set a DFC using average climatic and recharge conditions for the 50-year planning horizon. It was also clear that drought, being so unpredictable in location, duration, and severity, would be more appropriately and effectively managed by local GCDs through their drought rules and GMPs.

6.1.1.3 Groundwater Availability Model (GAM) Considerations

At the request of GMA-9, the TWDB also prepared several technical reports in the form of either GAM Runs or Tasks, to assist GMA-9 with their analysis using the HCT GAM (**Table 13**). The Trinity Aquifer DFC was set using the model simulations defined in GAM Task 10-005 that included the following probabilistic approach used to assess the 50-year DFC:

> *"The simulations completed as part of this task include seven pumping scenarios of the Trinity Aquifer that range from zero pumping to about twice current pumping. Each scenario included running 387 50-year simulations. The 387 50-year simulations were developed based on tree-ring precipitation estimates from 1537 to 1972 for the Edwards Plateau (Cleaveland, 2006). The results*

were used to evaluate the relationships between pumping versus drawdown, spring and base flow and outflow across the Balcones Fault Zone," (Hutchison, 2010, p. 3).

The seven scenarios in GAM Task 10-005 were based on the following varying 2008 pumping amounts:

- Scenario 1 – 0 ac-ft per year
- Scenario 2 – 20,000 ac-ft per year
- Scenario 3 – 40,000 ac-ft per year
- Scenario 4 – 60,000 ac-ft per year *(estimated 2008 conditions)*
- Scenario 5 – 80,000 ac-ft per year
- Scenario 6 – 100,000 ac-ft per year
- Scenario 7 – 120,000 ac-ft per year

One feature of the simulation was that recharge estimates based on tree-ring data changed annually, which acknowledged the natural variability in the recharge and response of the aquifer, including variations in water levels, spring flows, recharge, and droughts. The initial conditions were based on 2008 pumping and resulting water levels, and the approach accounted for significant variability in aquifer recharge and pumping that provided for a longer-term perspective to the water level declines in the Trinity Aquifer. Lastly, this modeling approach was similar to the approach typically used to assess impacts on spring flows for the Edwards Aquifer by implementing historical estimates of recharge and simulating different pumping scenarios.

GMA-9 members had extensive discussions and selected Scenario 6 (about 92,000 ac ft/year pumping) based on balancing competing water demands, such as supply needs, recreation, and environmental demands.

6.1.1.4 Achieving Subsection 36.108 (d-2) of the TWC "Balance Test" – Trinity Aquifer

Subsection 36.108 (d-2) of the TWC states:

"The desired future conditions proposed under Subsection (d) must provide a balance between the highest practicable level of production and the conservation, preservation, protection, recharging, and prevention of waste of groundwater and control of subsidence in the management area. . . .," (TWC §36.108 (d-2), p. 50).

As stated previously, in their November 16, 2011 hearing response, GMA-9 members noted that they developed the adopted Trinity Aquifer DFC "*according to the guidelines and laws governing the process, and attempted to set a DFC that "...provides a balance between the highest practicable level of groundwater production and the conservation, preservation, protection, recharging, and prevention of waste of groundwater in the management area,"* (GMA-9, 2011b, p.2). In so doing, they re-iterated their commitment to the goal of striking an equitable balance between all stakeholders and each of the areas in GMA-9.

GMA-9 determined that, consistent with stakeholder input, the most appropriate way to preserve base flow was to protect the primary source water (e.g. spring flow). Because the primary threat to spring flow was increased pumping, GMA-9 decided it was *"prudent, conservative and appropriate to set a DFC that would meet current demand, projected exempt demands, and have a bit left over for non-exempt use,"* (GMA-9, 2011b, p. 7).

The DFC was established to help manage the resource, pumping and resulting impacts, while allowing some water for future growth. With the majority of current and future pumping produced from exempt wells, the Trinity Aquifer DFC both acknowledged the effects of exempt pumping and allowed for some level of reasonable pumping from non-exempt wells. This was the type of consensus yield and resulting impacts that GMA-9 was striving to achieve when they adopted the DFC.

Lastly, the Trinity Aquifer DFC was an attempt to strike a balance and consensus among the GCDs. GMA-9 selected this DFC with the good of the entire region in mind, as well as the good of the local GCDs and counties. Under the new requirements of GMA and DFC planning set by the Texas Legislature in 2011, GMA-9 believed the DFC approved by GMA-9 for the Trinity Aquifer met the "balance test" mandate.

For these policy and technical reasons, GMA-9 adopted the DFC for the Trinity Aquifer stated in **Table 30**.

6.1.2 Policy and Technical Justifications – Edwards Group of the Edwards-Trinity (Plateau) Aquifer

The following discussion sets out GMA-9's policy and technical justifications in the second round of joint planning for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFC stated in **Table 29**, GMA-9's policy and technical justifications regarding this DFC during first round of joint planning, and how the adopted DFC for the Edwards Group of the Edward-Trinity (Plateau) Aquifer achieves the "balance test" described in Subsection 36.108 (d-2) of the TWC.

6.1.2.1 Second-Round of Joint Planning

The DFC set by GMA-9 for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer in July 2010 was based on a long-term target (50-year time period). During the initial five-year period since the DFC was adopted (years 2010-2015), the GCDs are now in the early stages of assessing the water level changes that occurred in the last five years, and gathering and reviewing other data and information related to implementing the DFC, such as comparing actual groundwater use to the MAG amounts for this aquifer.

Severe drought conditions have prevailed for most of the five-year period since the DFC was originally adopted, and the members of GMA-9 have determined that it is more beneficial to assess the DFC over a longer time period, and should the region return to a more normal or average weather pattern. The TWDB is updating the Edwards-Trinity Plateau GAM, and GMA-9 will look to the TWDB for guidance as to whether GMA-9 is to use the updated Edwards-Trinity Plateau GAM or the updated HCT GAM for assessments related to this aquifer. GMA-9 will use the GAM designated by the TWDB and other more current technical data as they contemplate developing and possibly setting a new DFC or new DFCs, as applicable. These two elements combined will enable the GCDs in GMA-9 to develop and implement a

practical and cost-efficient methodology for reviewing and refining new DFC(s) based on sufficient and relevant data gathered over a longer, more representative period of time, and to use the best available science to support the DFC decision(s) to ensure reasonableness and achievability.

6.1.2.2 First-Round of Joint Planning

During the first round of joint planning, GMA-9 undertook detailed consideration of DFCs and non-relevant aquifer classifications that supported the second round of planning. Therefore, a summary of the first round of DFC adoptions is included as part of this ER.

On July 26, 2010, GMA-9 adopted the following DFC for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer - "Allow no net increase in average drawdown in the Edwards Group of the Edwards-Trinity (Plateau) Aquifer in Kendall and Bandera Counties." In addition, GMA-9 declared the Edwards Group of the Edwards-Trinity (Plateau) Aquifer to be "not relevant" in Kerr and Blanco counties. GMA-9 submitted a record of this action, along with an adopted DFC for the Trinity Aquifer, to the TWDB on August 26, 2010. A copy of this letter is located in the GMA-9 files maintained in the BPGCD offices. The policy and technical justifications originally stated in this letter and summarized below are still applicable at this time.

Because the above DFC differed from the one recommended by the TWDB ("Allow up to 9 feet of drawdown in the Edwards Group") that was the result of an appeal process related to the original DFC set by GMA-9 for this aquifer, GMA-9 as required by the TWDB rules included a discussion of their process and policy and technical rationale for these decisions in their August 26, 2010 letter to the TWDB. Highlights of the August 2010 letter discussion follow.

Rationale for Blanco County– Declared "Not Relevant"

GMA-9 declared the portion of the Edward Group of the Edwards-Trinity (Plateau) located within Blanco County to be "not relevant" based on TWDB GAM Run 08-90 (Chowdhury, 2009), and the fact the BPGCD had no record of any well producing water from this aquifer (GMA-9, 2010b).

Rationale for Kerr County – Declared "Not Relevant"

On July 14, 2010, the HGCD Board of Directors voted to submit to GMA-9 that they declare the Edwards Group of the Edwards-Trinity (Plateau) Aquifer to be "not relevant" at this time, and that they not set a DFC. The HGCD reasoned that this aquifer should be declared as not relevant in Kerr County because: 1) the Edwards Group of the Edwards-Trinity (Plateau) Aquifer was considered to be less than 10 percent of groundwater use in Kerr County; 2) their rules prohibited non-exempt wells to be drilled into this aquifer; and 3) pumping from this aquifer was from exempt wells primarily used for domestic and livestock purposes and the GCD's ability to regulate these wells was limited (GMA-9, 2010b).

Rationale for Kendall and Bandera Counties – Adopted DFC

The two most common themes expressed to GMA-9 members throughout the five-year process were to ensure that the final DFCs did not mine the aquifers, and that spring flows, which sustain the Hill Country's creeks, streams and rivers, be considered and reasonably protected. Many of these springs originate from the Edwards Group of the Edwards-Trinity (Plateau) Aquifer, including those from this aquifer in Kendall and Bandera counties.

GMA-9 discussed the differences in the physical characteristics of the Edwards Group of the Edwards-Trinity (Plateau) Aquifer in Kendall and Bandera counties as compared to the portion of the aquifer in Kerr County. This technical discussion included comparisons of unit thicknesses and location, productions zones and resource viability for exempt wells, and recharge zones. GMA-9 concluded that due to the thinner section of the aquifer and limited recharge zones in Kendall and Bandera counties, the Edwards Group of the Edwards-Trinity (Plateau) Aquifer would be more sensitive to even limited increases in pumping withdrawals than the aquifer in Kerr County. Finally, and most importantly, GMA-9 noted that the aquifer in Kendall and Bandera counties did not share a significant hydrologic connection with the aquifer in Kerr County. Given these geologic truths, GMA-9 determined the two resource areas, the Kendall and Bandera counties' portion of the Edwards Group of the Edwards-Trinity (Plateau) Aquifer and the Kerr County portion of the aquifer could be managed differently.

GMA-9 also stressed the significance of these spring flows to the base flow for Cibolo Creek and their contribution to the Guadalupe River and Canyon Lake, the impact of these spring flows to Cibolo Creek and impacts on Boerne City Lake and other surface water supplies in the region, their effects on other aquifers, and their impacts on numerous creeks and streams, including spring flow to the Medina River and base flow contributions to Medina Lake. The Committee also provided a detailed discussion of the impacts of reduced spring flows to the City of Boerne and negative impacts on the city's ability to conjunctively manage its groundwater and surface water resources. Potential impacts resulting in increased costs to the City of Boerne for water supply replacement and water treatment expansion were also discussed. GMA-9 also pointed out possible impacts leading to reduced downstream environmental flows, diminished nutrients for aquatic systems, and diminished recharge in southern Kendall and northern Bexar counties. Lastly, GMA-9 noted that reductions in flows to Canyon and Medina lakes could necessitate changes in the management of both of these lakes that are obligated to provide water for municipal, agricultural, industrial, recreational and environmental uses, and depend on the base flow provided by springs many of which originate from the aquifer in Kendall and Bandera counties.

There were also other policy and technical considerations that factored into GMA-9's July 26, 2010 Edwards Group of the Edwards-Trinity (Plateau) Aquifer decision. Throughout the five-year process of developing DFCs, GMA-9 consistently maintained that a DFC of "allowing for no net increase in average drawdown" provided the best chance of maintaining spring flow and base flow to creeks and rivers as close to current average levels as possible. Many local GCDs, such as the BPGCD and the HGCD, prohibited the completion of new non-exempt wells in the Edwards Group of the Edwards-Trinity (Plateau) Aquifer. The CCGCD rules also prohibited any new wells drilled into the Edwards Group of the Edwards-Trinity

(Plateau) Aquifer, and provided for protection of the aquifer particularly that portion where its springs feed Boerne City Lake.[7] The DFC contemplated by GMA-9 would help to support those management strategies.

Exempt well use was considered to be minimal and expansion of this type of demand was expected to be slow and spread out over the 50-year planning period. GMA-9 reasoned that this timeframe would allow the GCDs to develop and implement various management strategies and incentives, such as water conservation, reuse, and rainwater harvesting that could further reduce demand on the aquifer and help to achieve the DFC. Any additional demand could be provided by the underlying Trinity Aquifer (GMA-9 2010b).

In summary, the Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFC would:

- Comply with the requirements of Chapter 36 of the TWC;
- Address the concerns expressed by a significant number of stakeholders in a variety of public forums to "protect spring flow and base flow to creeks and rivers";
- Provide a DFC that provides maximum, reasonable and achievable protection for springs and base flow to creeks and rivers;
- Result in a possible MAG quantity that could allow for some future additional demand on the Edwards Group; and
- Result in a possible MAG quantity that local GCDs could implement, measure and achieve using a variety of water management strategies available to GCDs (GMA-9, 2010a,).

6.1.2.3 Groundwater Availability Model (GAM) Considerations

The TWDB also prepared, at the request of GMA-9, various technical reports in the form of either GAM Runs or Tasks to assist GMA-9 with their analysis (**Table 13**). These reports were developed using the HCT GAM.

In GAM Run 08-90 mag, the TWDB developed "Managed Available Groundwater" estimates to meet the DFC adopted earlier in the planning cycle to "Allow for no net increase in average drawdown in the Edwards Group of the Edwards-Trinity (Plateau) Aquifer in Kendall and Bandera counties." Those MAG estimates resulted in a groundwater availability amount of approximately 1,000 ac-ft for both Bandera and Kendall counties (Chowdhury, 2009).

6.1.2.4 Subsection 36.108 (d-2), TWC – "Balance Test" – Edwards Group of the Edwards-Trinity (Plateau) Aquifer

As mentioned previously, the two most common themes expressed to GMA-9 members throughout the process to adopt DFCs for GMA-9, including the Edwards Group of the Edwards-Trinity (Plateau) Aquifer

[7] The BCRAGD rules also prohibit new non-exempt wells into the Edwards Group of the Edwards-Trinity Aquifer. Production from this aquifer is from exempt wells on large tracts of land in western Bandera County. All "drill-through" wells must seal off the Edwards Group of the Edwards-Trinity (Plateau) Aquifer.

DFC, were to ensure that the final DFCs did not mine the aquifers and that spring flows be considered and reasonably protected.

GMA-9 representatives acknowledged in the November 2, 2009 TWDB hearing on the petitions challenging the reasonableness of the Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFC that all non-exempt and exempt wells are managed to varying degrees by the individual GCDs through rules developed in compliance with their enabling legislation and Chapter 36 of the TWC.

Also as stated previously, GMA-9 believed this DFC would:

- Comply with the requirements of Chapter 36 of the TWC;
- Address the concerns expressed by a significant number of stakeholders in a variety of public forums to "protect spring flow and base flow to creeks and rivers";
- Provide a DFC with maximum, reasonable and achievable protection for springs and base flow to creeks and rivers;
- Result in a possible MAG quantity that could allow for some future additional demand on the Edwards Group; and
- Result in a possible MAG quantity that local GCDs could implement, measure and achieve using a variety of water management strategies available to GCDs (GMA-9, 2010a,).

For these policy and technical justifications, GMA-9 adopted the DFC for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer stated in **Table 30**.

6.1.3 GMA-9 Section 36.108 (d) of TWC Factor Consideration, and Impact of Trinity and Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFCs on Each Factor

As stated previously in **Chapter 3.0 –** STATUTORY AND REGULATORY REQUIREMENTS RELATED TO JOINT PLANNING AND DESIRED FUTURE CONDITIONS of this ER, before GMA-9 could adopt any proposed DFCs, Section 36.108 (d) of the TWC requires that:

> *"(d) Not later than September 1, 2010, and every five years thereafter, the districts shall consider groundwater availability models and other data or information for the management area and shall propose for adoption desired future conditions for the relevant aquifers within the management area. Before voting on the proposed desired future conditions of the aquifers under Subsection (d-2), the districts shall consider:*
>
> *(1) aquifer uses or conditions within the management area, including conditions that differ substantially from one geographic area to another;*
>
> *(2) the water supply needs and water management strategies included in the state water plan;*

(3) hydrological conditions, including for each aquifer in the management area the total estimated recoverable storage as provided by the executive administrator, and the average annual recharge, inflows, and discharge;

(4) other environmental impacts, including impacts on spring flow and other interactions between groundwater and surface water;

(5) the impact on subsidence;

(6) socioeconomic impacts reasonably expected to occur;

(7) the impact on the interests and rights in private property, including ownership and the rights of management area landowners and their lessees and assigns in groundwater as recognized under Section 36.002;

(8) the feasibility of achieving the desired future condition; and

(9) any other information relevant to the specific desired future conditions," (TWC §36.108, p. 49).

Section 36.108 (d-3) goes on to state that:

"(d-3) After the earlier of the date on which all the districts have submitted their district summaries or the expiration of the public comment period under Subsection (d-2), the district representatives shall reconvene to review the reports, consider any district's suggested revisions to the proposed desired future conditions, and finally adopt the desired future conditions for the management area. The desired future conditions must be adopted as a resolution by a two-thirds vote of all the district representatives. The district representatives shall produce a desired future conditions explanatory report for the management area and submit to the development board and each district in the management area proof that notice was posted for the joint planning meeting, a copy of the resolution, and a copy of the explanatory report. The report must:

(1) identify each desired future condition;

(2) provide the policy and technical justifications for each desired future condition;

(3) include documentation that the factors under Subsection (d) were considered by the districts and a discussion of how the adopted desired future conditions impact each factor;

(4) list other desired future condition options considered, if any, and the reasons why those options were not adopted; and

(5) discuss reasons why recommendations made by advisory committees and relevant public comments received by the districts were or were not incorporated into the desired future conditions," (TWC §36.108 (d-3), p. 51).

As previously discussed is **Chapter 4.0** – GMA-9 JOINT PLANNING AND DESIRED FUTURE CONDITION DEVELOPMENT PROCESS of this ER, on September 28, 2015, the members of GMA-9 received a detailed presentation on all of the nine factors and considered them as they related to DFCs in general and the four being contemplated by GMA-9. A complete copy of that presentation is located in the GMA-9 files maintained at the BPGCD offices.

The following provides a discussion of GMA-9's consideration of each factor as they relate to the GMA-9 major aquifer DFCs, and their impacts on each factor.

6.1.3.1 Aquifer Uses or Conditions within the Management Area, Including Conditions That Differ Substantially from One Geographic Area to Another

The following is a discussion of GMA-9's consideration of this first factor identified in Subsection 36.108 (d) of the TWC to be discussed in the ER, and how the adopted DFCs for the Trinity and Edwards Group of the Edwards-Trinity (Plateau) aquifers impact this factor.

6.1.3.1.1 GMA-9 Trinity Aquifer Uses and Conditions

The Trinity Aquifer is commonly subdivided into discrete hydrostratigraphic units: the Upper; Middle; and Lower Trinity aquifers. Additionally, depth to the water-bearing Trinity Group formations is determined by the underlying structural elements and depositional environments.

The Upper Glen Rose Formation, which forms the Upper Trinity Aquifer, often contains water with relatively high concentrations of sulfate. Total dissolved solids (TDS) often exceed 1,000 milligrams per liter (mg/l), especially in wells that penetrate "gyp" (evaporite) beds. Water in evaporite beds has a tendency to be high in sulfate and generally should be sealed off in a well. Upper Trinity wells are generally shallow and are mostly used for domestic and livestock purposes.

The Middle Trinity Aquifer, consisting of lower Glen Rose, Hensell, and Cow Creek formations, generally contains TDS of less than 1,000 mg/l. In the Hill Country region, the primary contribution to poor water-quality occurs in wells that do not adequately case off water from evaporite beds in the upper part of the Glen Rose (Upper Trinity Aquifer). Water levels in Upper and Middle Trinity wells fluctuate with seasonal precipitation and are highly susceptible to declines during drought conditions.

The Lower Trinity Aquifer is composed of sandy limestone, sand, clay and shale of the Sligo and Hosston. The Lower Trinity thins toward the northeast and is completely missing or coalesces with upper Trinity units near the Llano Uplift. Yields from wells completed into the Lower Trinity are generally unpredictable and vary greatly. In some areas, the Lower Trinity has higher yields and better water quality than shallower aquifers. Recharge to the Lower Trinity in Bandera and Kerr counties likely occurs primarily by lateral

underflow from the north and west. The overlying Hammett Shale mostly prevents vertical movement of water downward except possibly in highly fractured or faulted areas.

TWDB Trinity Aquifer water use estimates from 2013 (non-exempt) and 2015 (exempt) are tabulated in **Table 31** and **Table 32. Table 31** estimates are for entire counties, so they may not be representative of GMA-9 use in partial counties. Additionally, the "county – other" user group is not included in this table. **Table 32** is grouped by GCD, and should give the best currently available estimate of exempt use. **Table 33** shows 2008 Trinity Aquifer pumping estimates provided by the GCDs. Although each data set has its own unique data gaps, the estimates align relatively well with each other.

Table 31. TWDB Trinity Aquifer Groundwater Pumping Estimates by Use for 2013 (by GMA-9 County)

GMA-9 County	Type of Use and Estimated Use Amounts for 2013 (in ac-ft)						
	Municipal	Manufacturing	Mining	Steam Electric Power	Irrigation	Livestock	Totals
Bandera	2,339	0	0	0	778	77	**3,194**
Bexar	10,448	0	3,685	0	601	29	**14,763**
Blanco	1,083	0	0	0	547	104	**1,734**
Comal	4,025	2	7	0	100	46	**4,180**
Hays	4,757	0	0	0	290	14	**5,061**
Kendall	3,504	1	0	0	477	291	**4,273**
Kerr	3,954	0	31	0	1,011	84	**5,080**
Medina	213	0	0	0	0	119	**332**
Travis	8,278	5	0	0	471	54	**8,808**
Totals	**38,601**	**8**	**3,723**	**0**	**4,275**	**818**	**47,425**

Source: TWDB Water Use Survey Team, Historical Groundwater Pumping Estimates

Table 32. TWDB Trinity Aquifer Estimated Exempt Use for 2015 (by GMA-9 Groundwater Conservation District)

GMA-9 GCD	Exempt Use Estimates (in ac-ft)
BCRAGD	1,870
BSEACD	171
BPGCD	650
CTGCD	327
CCGCD	2,323
EAA	n/a
HTGCD	3,535
HGCD	1,145
MCGCD	128
TGRGCD (includes municipal exempt)	-
Estimated Exempt Use Total	**9,564**

Source: TWDB Projected Exempt Groundwater Use Estimates, GMA-9, December 2015

Table 33. Estimated 2008 Trinity Aquifer Pumping Provided by GMA-9 Groundwater Conservation Districts (by County) (in ac-ft)

County	Upper Trinity Aquifer	Middle Trinity Aquifer	Lower Trinity Aquifer	Total Pumping
Bandera	288	3,567	515	**4,370**
Bexar	693	14,110	197	**15,000**
Blanco	77	1,477	0	**1,554**
Comal	398	5,788	0	**6,186**
Hays	416	4,800	449	**5,665**
Kendall	300	6,060	325	**6,685**
Kerr	213	6,263	5,534	**12,010**
Medina	0	500	1,000	**1,500**
Travis	551	4,967	0	**5,518**
Totals	**2,936**	**47,532**	**8,020**	**58,488**

Source: Hutchison, 2010

Table 33 estimates indicated that in 2008, about 81 percent of GMA-9 pumping was from the Middle Trinity Aquifer, about 14 percent was from the Lower Trinity Aquifer, and approximately five percent of Trinity pumping came from the Upper Trinity Aquifer.

No pumping data from Travis County outside of the BSEACD was readily available at the time these data were requested from the GCDs (Hunt et. al, 2011). Generally, the Middle Trinity Aquifer is depleted and all wells are completed in the Lower Trinity in western Travis County. Therefore, these numbers are not a realistic representation of actual Middle and Lower Trinity Aquifer pumping in Travis County.

A list of the 55 active real-time groundwater monitoring wells located in GMA-9 (**Table 34**) indicates that currently one real-time monitoring well is installed in the Upper Trinity Aquifer, 41 are completed in the Middle Trinity Aquifer, and thirteen are completed in the Lower Trinity Aquifer. The well counts by aquifer are distributed similarly to the pumping shown in **Table 33**, with the majority of monitoring wells (nearly 75 percent) being located in the Middle Trinity Aquifer.

Table 34. Real-Time Monitoring Well Counts in GMA-9

County	Upper Trinity Aquifer	Middle Trinity Aquifer	Lower Trinity Aquifer
Bandera			1
Bexar (TGRGCD)	1	6	
Blanco		8	1
Comal		2	
Hays		4	2
Kendall		9	1
Kerr		12	7
Medina			
Travis			1
Total Well Counts	**1**	**41**	**13**

Source: Water Data for Texas, 2016

Hydrographs of the Trinity monitoring wells in **Figure 19** through **Figure 21** were selected because they have the longest periods of record. Not all periods of record precede the year 2000. In year 2000, the depth to water in Middle Trinity Monitoring Well 68-02-609 (**Figure 19**) was near 110 ft below ground level

(bgl). The most recent measurement from February 2016 was 118 ft bgl, which indicates a water level decline of about 18 ft since 2000 at this well location. Note that the lowest static water level measured since 2000 was about 160 ft bgl, which indicates a total decline of about 50 ft in 2011 and again in 2014, during severe drought conditions.

In August 2008, the depth to water in Lower Trinity Monitoring Well 69-24-225 (**Figure 20**) was 438.28 ft bgl. The most recent measurement in February 2016 was 433.84 ft bgl. Note that this well also shows an extreme water level decline of approximately 495 ft during the severe drought conditions in 2011. These data indicate that a water level decline of five ft has occurred over the last seven years at this well location.

In the year 2000, the depth to water in Upper Trinity Monitoring Well 68-19-806 (**Figure 21**) was approximately 210 ft bgl. The most recent water level measurement from February 2016 was 229.39 ft bgl. This indicates a water level decline of approximately 19 ft in 16 years at this well location. Note that the depth to water measured nearly 350 ft bgl in late 2014-early 2015, which is a decline of over 100 feet.

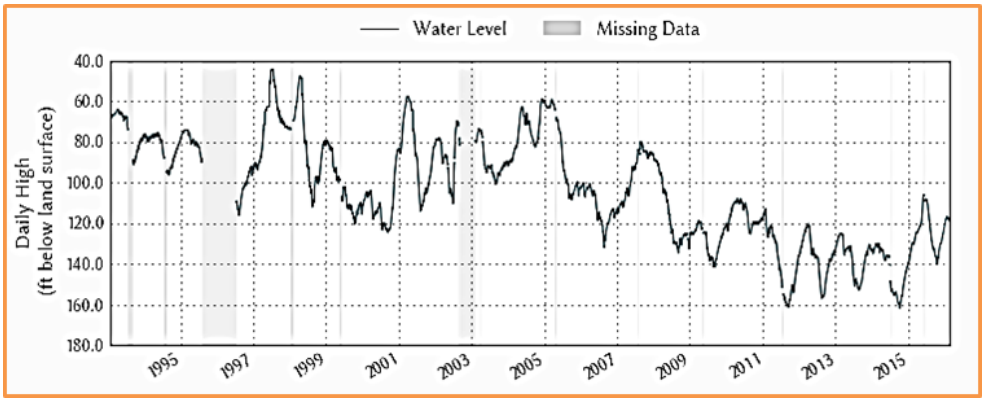

Figure 19. Hydrograph of Middle Trinity Monitoring Well 68-02-609 in Kendall County.

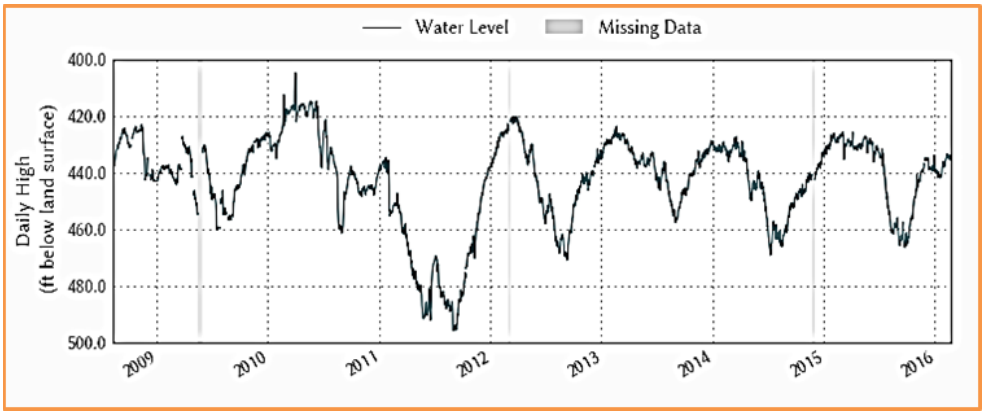

Figure 20. Hydrograph of Lower Trinity Monitoring Well 69-24-225 in Bandera County.

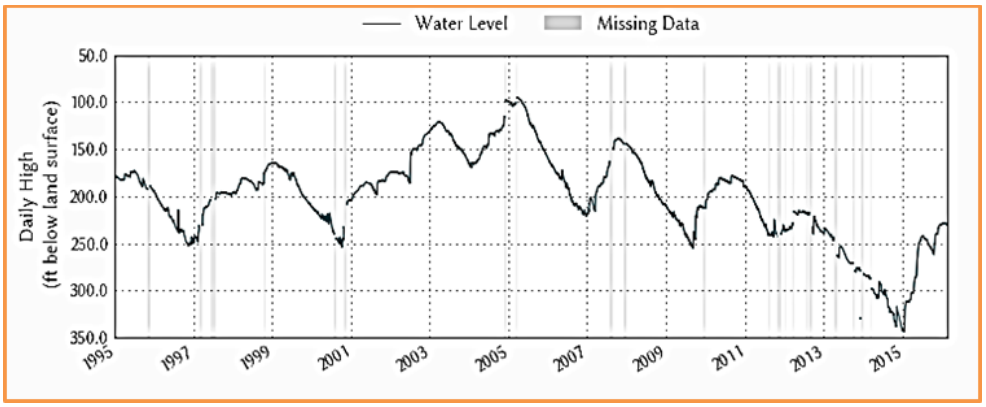

Figure 21. Hydrograph of Upper Trinity Monitoring Well 68-19-806 in Bexar County.

6.1.3.1.2 GMA-9 Edwards Group of the Edwards-Trinity (Plateau) Aquifer Uses and Conditions

A discussion of general characteristics of the Edwards Group of the Edwards-Trinity (Plateau) Aquifer can be found in **Chapter 2.0** – GMA-9 DESCRIPTION, **Subsection** 2.3.1.2, Edwards Group of the Edwards-Trinity (Plateau) Aquifer, and **Chapter 5.0** – GMA-9 PROPOSED NON-RELEVANT AQUIFER CLASSIFICATIONS, **Subsection 5.1.2.2**, Aquifer Characteristics, Groundwater Demands, Current Groundwater Uses, Included Total Estimated Recoverable Storage (TERS) of this ER.

TWDB Edwards Group of the Edwards-Trinity (Plateau) Aquifer water use estimates from 2013 (non-exempt) and 2015 (exempt) are tabulated in **Table 35** and **Table 36**, respectively. **Table 35** estimates are for entire counties, so these amounts may not be representative of GMA-9 use in partial counties. Additionally, the "county – other" user group is not included in this table. Estimates are shown for all aquifers to give a relative idea of what percent of pumping can be attributed to the Edwards Group within these counties. **Table 36** is grouped by GCD, and should give the currently available best estimate of exempt use. **Table 37** shows 2008 Edwards Group of the Edwards-Trinity (Plateau) Aquifer pumping estimates provided by the GCDs.

Table 35. TWDB Groundwater Pumping Estimates for 2013

Year	County	Aquifer	Municipal	Manufacturing	Mining	Steam Electric Power	Irrigation	Livestock	Totals
2013	Bandera	Edwards Group	66	0	0	0	0	69	**135**
2013	Bandera	Other	7	0	0	0	0	0	**7**
2013	Bandera	Trinity	2,339	0	0	0	778	77	**3,194**
2013	Kendall	Edwards Group	53	0	0	0	0	17	**70**
2013	Kendall	Trinity	3,504	1	0	0	477	291	**4,273**
2013	Kerr	Edwards Group	859	0	0	0	66	163	**1,088**
2013	Kerr	Other	45	0	0	0	0	4	**49**
2013	Kerr	Trinity	3,954	0	31	0	1,011	84	**5,080**

Source: TWDB Water Use Survey Team, Historical Groundwater Pumping Estimates

Table 36. TWDB Edwards Group of the Edwards-Trinity (Plateau) Aquifer Estimated Exempt Use for 2015 (by GMA-9 Groundwater Conservation District)

GMA-9 GCD	Exempt Use Estimates (in ac-ft)
BCRAGD	181
BPGCD	2
CCGCD	41
HGCD	926
Total Estimated Exempt Use	**1,050**

Source: TWDB Projected Exempt Groundwater Use Estimates, GMA-9, December 2015

Table 37. Estimated 2008 Edwards Group of the Edwards Trinity (Plateau) Aquifer Pumping Provided (by GMA-9 Groundwater Conservation District)

County	Edwards Group of Edwards-Trinity (Plateau) Aquifer (in ac-ft)
Bandera	631
Kendall	315
Kerr	1,035
Total	**1,981**

Source: Hutchison, 2010

In June 2011, the static water level in Edwards Group of the Edwards-Trinity (Plateau) Monitoring Well 69-12-206 was measured at 253.63 ft bgl. This is the first publicly-available water level measurement for this well, which was installed in October 2010. In November 2012, the depth to water was 249.96 ft bgl (**Figure 22**). The most recent measurement in February 2016 was 247.80 ft bgl. Note that the period of record for this well begins during an extended period of severe drought. The greatest known depth to water measurement since the well was installed was 253.63 ft bgl in June 2011. Since that time, the water level has rebounded 5.8 ft. No relevant water level data for the year 2000 from surrounding well records could be found for DFC comparison.

In February 2011, the static water level in Edwards Group of the Edwards-Trinity (Plateau) Monitoring Well 57-58-203 was measured at 58.46 ft bgl. This is the first publicly-available water level measurement for this well, which later was equipped as a real-time monitoring well in October 2015 (**Figure 23**). The greatest depth to water measurement of 61.55 ft bgl was recorded at that time. The most recent February 2016 measurement was 58.91 ft bgl. These data indicate that during severe drought conditions, the water level in the well dropped approximately three ft and subsequently rebounded since that time. No relevant water level data for the year 2000 from surrounding well records could be found for DFC comparison.

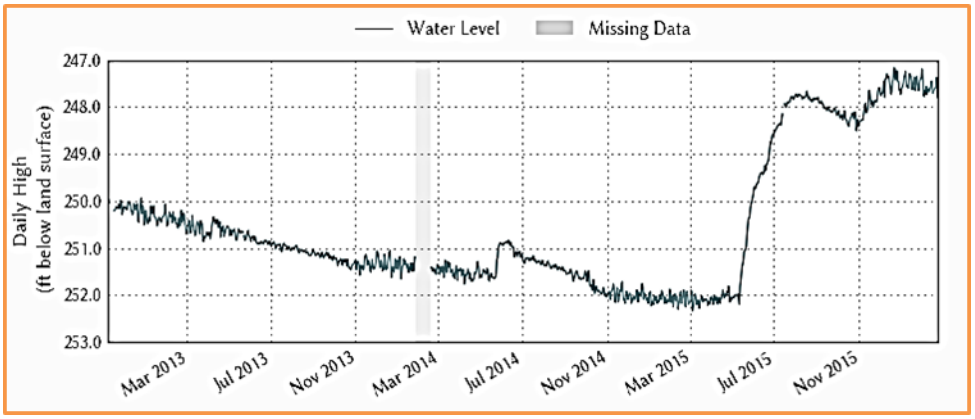

Figure 22. Hydrograph of Edwards Group of the Edwards-Trinity (Plateau) Monitoring Well 69-12-206 in Bandera County.

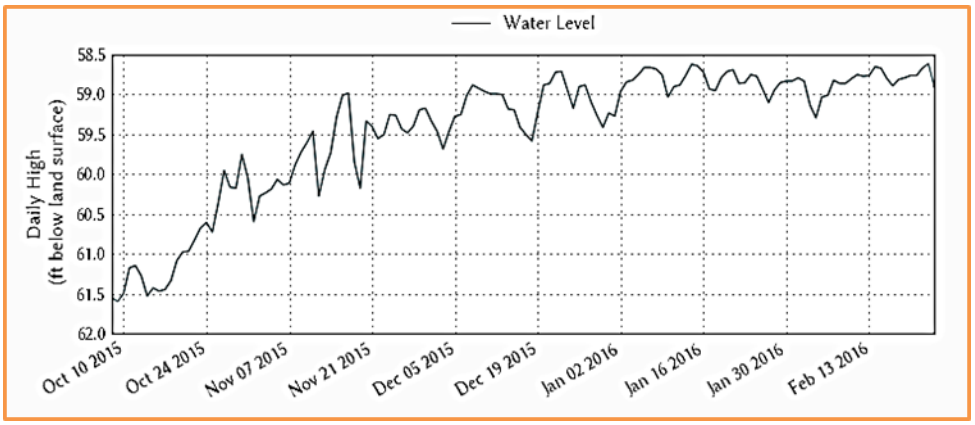

Figure 23. Hydrograph of Edwards Group of the Edwards-Trinity (Plateau) Monitoring Well 57-58-203 in Kendall County.

6.1.3.1.3 Impact of Trinity Aquifer DFC on Aquifer Uses and Conditions

It is critical to keep in mind that the DFCs consider the long-term average water level change in an aquifer as a whole – not in individual wells, and are not designed to be compared to instantaneous measurements as a metric of adequacy or reasonableness. With this in mind, the hydrographs (**Figure 19**, **Figure 20**, and **Figure 21**) suggest that the Upper, Middle and Lower Trinity Aquifers do have the ability to recover from sustained severe drought conditions. An exception has been noted by the HTGCD that the Lower Trinity hydrographs within the HTGCD Blanco Valley show no response to rain events. Although water levels during (potentially) the DOR did exceed the 30 ft DFC at wells 68-02-609, 69-24-225, and 68-19-806 for an extended period of time, they have maintained compliance with the average 30 ft DFC metric.

The hydrographs suggest that the 30 ft DFC can be achieved in some locations when considering long-term average change in water levels. This may not be the case at all individual well locations; however, when considering long-term sustainability, the averaging of individual wells within a county will tend to moderate the results.

6.1.3.1.4 Impact of Edwards Group of Edwards-Trinity (Plateau) Aquifer DFC on Aquifer Uses and Conditions

The Edwards Group of the Edwards-Trinity (Plateau) Aquifer accounts for approximately four, two and 18 percent of all estimated groundwater pumping in Bandera, Kendall, and Kerr Counties, respectively. These percentages are based on the historical pumping estimates for all aquifers. Since Kerr County has a surface water right of over 4,000 ac-ft/year, pumping from the Edwards Group actually represents about ten percent of water use in the county (excluding exempt users). Note that irrigation and livestock users are generally considered exempt users, but for the purposes of weighting total county use by aquifer, these user groups were included in the calculations.

These estimates do indicate that the exempt use in these counties is substantial. This exempt/non-exempt pumping distribution is a significant factor when considering how much impact a DFC may actually have upon pumping regulations within the counties with many active exempt groundwater users. Diligence in managing non-exempt well owners, therefore, becomes paramount to maintaining good stewardship while promulgating DFC compliance and achieving some sense of reasonable balance. Additionally, the hydrographs do suggest the ability of the Edwards Group of the Edwards-Trinity (Plateau) Aquifer in these counties to rebound after periods of prolonged stress. Only minor water level fluctuations can be seen since the most recent drought conditions. Although the periods of record for these wells do not have the desired historical data, they do suggest that a DFC of zero drawdown could be sustainable at this point in time.

6.1.3.2 The Water Supply Needs and Water Management Strategies Included in the State Water Plan

The following is a discussion of GMA-9's consideration of this second factor by identified in Subsection 36.108 (d) of the TWC to be discussed in the ER, and how the adopted Trinity and Edwards Group of the Edwards-Trinity (Plateau) aquifer DFCs impact this factor.

Subsection 36.1071(e)(4) of the TWC also requires that GCDs consider the water supply needs and water management strategies, included in the state water plan, among other considerations, in developing and adopting their GMPs (TWC §36.1071(e)). To comply with this requirement, the GCDs in GMA-9 all have adopted GMPs that include consideration of the water supply needs and water management strategies identified in the most recently adopted SWP that was in place at the time their GMPs were adopted. Given the various GCD deadlines for adopting GMPs, this factor discussion focuses on the water supply needs and water management strategies contained in the 2012 State Water Plan for those counties located within the GMA-9 GCDs.

6.1.3.2.1 2012 State Water Plan Water Supply Needs and GMA-9

Chapter 6 (Water Supply Needs) of the SWP contains a summary of water supply needs information for all of the 16 RWPGs across the State of Texas. This chapter summarizes the RWPG information related to comparing existing water supplies with current and projected water demands to identify where and when additional water supplies would be needed (TWDB, 2012b).

Table 6.1 of the 2012 State Water Plan provides a summary of water needs identified by the RWPGs by region (in ac-ft per year, or ac-ft/year). The information for Regions J, K, and L, since those RWPGs include counties located within GMA-9, are contained in **Table 38** below. This information was extracted from Table 6.1 in the SWP.

Table 38. 2012 State Water Plan Water Supply Needs for Regions J, K, and L

Region	Amounts By Decade (in ac-ft/year)					
	2010	2020	2030	2040	2050	2060
J	1,494	1,878	2,044	2,057	2,275	2,389
K	255,709	303,240	294,534	309,813	340,898	367,671
L	174,235	265,567	308,444	350,063	390,297	436,751

Source: TWDB, 2012b

Table 6.3 of the SWP further breaks out this information by use category for each region in ac-ft/year. The information for Regions J, K, and L contained in **Table 39** below was extracted from Table 6.3. Again, the water supply needs for Regions J, K, and L are being highlighted as only parts of these regions relate to GMA-9.

Table 39. 2012 State Water Plan Water Supply Needs by Use Category for Regions J, K, and L

Region	Amounts by Decade (in ac-ft/year)						
	Category	2010	2020	2030	2040	2050	2060
J	Municipal	1,494	1,878	2,044	2,057	2,275	2,389
K	Irrigation	234,738	217,011	198,717	181,070	164,084	135,822
	Manufacturing	146	298	452	605	741	934
	Mining	13,550	13,146	12,366	6,972	5,574	5,794
	Municipal	6,894	19,592	29,636	44,548	88,381	135,891
	Steam-electric	193	53,005	53,175	76,430	81,930	89,042
	Livestock	188	188	188	188	188	188
L	Irrigation	68,465	62,376	56,519	50,894	45,502	41,782
	Manufacturing	6,539	13,888	20,946	27,911	34,068	43,072
	Mining	521	726	1,771	1,992	2,293	2,493
	Municipal	96,653	137,614	178,217	218,245	256,777	297,386
	Steam-electric	2,054	50,962	50,991	51,021	51,657	52,018
	Livestock	3	1	0	0	0	0

Source: *TWDB, 2012b*

On September 28, 2015, GMA-9 was provided with, and considered, a detailed listing of all water supply needs contained in the 2012 SWP for the counties covered by the GMA-9 GCDs within Regions J, K, and L. It is important to note that the water supply needs listed in the 2012 SWP include the entire county, and GMA-9 may not contain the entire county within its boundaries. The TWDB provides this and other statutorily-required data to the GCDs to prepare their updated GMPs. Some of this data is apportioned by formula to reflect district-specific information as required by the TWC. The water supply needs data, however, is provided on a county-wide basis because the GCDs are only required to consider the information in these tables (TWC §36.1071 (e) (4) and Allen, 2015a-i). A copy of the water supply needs list presented to GMA-9 on September 28, 2015 titled *2012 State Water Plan – Water Supply Needs GMA-9 GCDs and Counties (By GCD and County)* is located in the GMA-9 files maintained in the BPGCD offices.

6.1.3.2.2 2012 State Water Plan Water Management Strategies and GMA-9

Chapter 7 (Water Management Strategies) of the 2012 SWP contains summary water management strategy information for all of the 16 regional water plan areas across the State of Texas. This chapter summarizes RWPG information related to identifying potential water management strategies to meet the regions' identified water supply needs. The discussion identifies potential water management strategy supply volumes, and capital costs, by region (TWDB, 2012b).

Table 7.1 of the 2012 SWP provides a summary of water management strategy supply volumes identified by the RWPGs by region (in ac-ft/year). The information for Regions J, K, and L contained in **Table 40** below was extracted from Table 7.1.

Table 40. 2012 State Water Plan Water Management Strategy Supply Volumes for Regions J, K, and L

Region	Volumes by Decade (in ac-ft/year)					
	2010	2020	2030	2040	2050	2060
J	13,713	16,501	20,360	20,862	20,888	23,010
K	350,583	576,795	554,504	571,085	565,296	646,167
L	188,297	376,003	542,606	571,553	631,476	765,738

Source: TWDB, 2012b

Table 7.5 of the 2012 SWP provides a summary of recommended water management strategy capital costs by region (in millions of dollars). The information for Regions J, K, and L contained in **Table 41** below was extracted from Table 7.5.

Table 41. 2012 State Water Plan Water Management Strategy Capital Costs for Regions J, K, and L

Region	In Millions of Dollars by Decade						
	2010	2020	2030	2040	2050	2060	Total
J	$11	$44	—	—	—	—	$55
K	$663	$67	$4	$169	—	$4	$907
L	$1,022	$2,973	$2,321	$2	$12	$1,294	$7,623

Source: TWDB, 2012b

The potential management strategy supply volumes are also divided by type of strategy, and the strategies related to groundwater include municipal conservation, irrigation conservation, other conservation related to manufacturing, mining and steam-electric power, groundwater, reuse, groundwater desalination, conjunctive use, aquifer storage and recovery, weather modification, drought management, and brush control. Chapter 7 also includes summaries of management strategy water supply volumes from conservation strategies by region, and a listing of ground and surface water conveyance and transfer strategies included in the plan. **Table 42** below is a summary of the groundwater conveyance strategies listed in the 2012 SWP.

Table 42. 2012 State Water Plan Recommended Groundwater Conveyance and Transfer Water Management Strategies

Project	Conveyance From	Conveyance To
Roberts County Well Field	Roberts County	Amarillo
Potter County Well Field	Potter County	Amarillo
Integrated Water Management Strategy - Import From Dell Valley	Dell City	El Paso

Table 42. 2012 State Water Plan Recommended Groundwater Conveyance and Transfer Water Management Strategies

Project	Conveyance From	Conveyance To
Develop Cenozoic Aquifer Supplies	Winkler County	Midland
Conjunctive Use (Lake Granger Augmentation)	Burleson County	Mclennan
Conjunctive Use (Lake Granger Augmentation)	Burleson County	Round Rock
Guadalupe-Blanco River Authority Simsboro Project	Lee County	Comal County
Regional Carrizo For Saws (Including Gonzales County)	Gonzales County	Bexar County
Guadalupe-Blanco River Authority Mid-Basin (Surface Water)	Gonzales County	Comal County
Texas Water Alliance Regional Carrizo (Including Gonzales County)	Carrizo-Wilcox Aquifer	Comal County

Source: TWDB, 2012b

Of the ten groundwater conveyance and transfer water management strategies included in the 2012 SWP, none of them involve transferring groundwater from any of the aquifers located within GMA-9 to either other counties within GMA-9 or to locations outside of GMA-9. Four of them propose to bring water from outside of GMA-9 to serve some part of a county that may be located within GMA-9.

On September 28, 2015, GMA-9 was provided with, and considered, a detailed listing of all water management strategies contained in the 2012 SWP for the counties covered by the GMA-9 GCDs within Regions J, K, and L. It is important to note that the water management strategies listed in the 2012 SWP include the entire county, and GMA-9 may not contain the entire county within its boundaries. The TWDB provides this and other statutorily-required data to the GCDs to prepare their updated GMPs. Some of this data is apportioned by formula to reflect district-specific information as required by the TWC. The water management strategies data, however, is provided on a county basis because the GCDs are only required to consider the information in these tables (TWC §36.1071(e) (4) and Allen, 2015a-i). A copy of the water management strategies list presented to GMA-9 on September 28, 2015 titled *2012 State Water Plan – Water Management Strategies GMA-9 GCDs and Counties (By GCD and County)* is located in the GMA-9 files maintained in the BPGCD offices.

6.1.3.2.3 Impacts of Trinity Aquifer and Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFCs on Water Supply Needs and Water Management Strategies Included in the State Water Plan

These DFCs and generated MAGs were generally not available when the 2011 RWPs for Regions J, K, and L were being finalized, and therefore, were not considered in the adoption of the 2012 SWP. For the Trinity Aquifer, groundwater availability estimates were used in these three RWPs. For the Edwards Group of the Edwards-Trinity (Plateau) Aquifer, Region L used the 2009 DFC and MAG for this aquifer in Kendall County. Groundwater availability estimates for this aquifer were used in Regions J and K. No impacts from either of these DFCs or resulting MAGs have been identified with regard to any water supply needs or water management strategies in the 2012 State Water Plan. The GCDs are actively involved in managing the use of these groundwater resources within their respective counties.

GMA-9 is working hard to bring the joint planning and DFC process in line with the RWP process to provide Regions J, K, and L with MAG amounts that are based upon current DFCs. Looking ahead, MAGs based upon these DFCs were used in developing the water supply needs and water management strategies

contained in the 2016 RWPs for Regions J, K, and L. None of the water management strategies in the 2016 RWPGs with either the Trinity Aquifer or the Edwards Group of the Edwards-Trinity (Plateau) Aquifer as the water source and within GMA-9 have been identified as MAG-limited. Therefore, GMA-9 does not anticipate that these DFCs will have an impact on the water supply needs or water management strategies in the 2017 SWP.

With regard to the role of the MAG in regional water planning, the TWDB's guidance documents state that RWPGs cannot include water management strategy supply volumes that exceed the MAGs (TWDB, 2014 and TWDB, 2015a). Given this direction, the Region L 2016 RWP contains language for certain water management strategies that either shows "0" groundwater available for that strategy, or modifies the amount downward for that strategy because the project exceeds the MAG for that particular aquifer that is the source water for that proposed strategy. Both the TWDB and Region L note, however, that the regional water planning process cannot modify permits already issued or permits to be issued by GCDs, and it cannot modify the DFCs or resulting MAGs. Permitting decisions are solely within the purview of the GCDs, and the DFCs can only be modified by the GCDs within the GMA.

These DFCs are a long-term planning goal, and will be reviewed and revisited at least every five years, or sooner if necessary, during joint planning. GCDs can re-evaluate the DFCs in light of changed circumstances including any potential impacts on the 2012 or other SWP, and may do so as needed. RWPs could also be amended if the DFCs and resulting MAGs are revised, causing some water management strategies with previously shown "0" yield as becoming recommended water management strategies in the RWP. It is also important to note that GCD representatives serve as members of the RWPGs to increase coordination and communication on regional and state water planning issues.

6.1.3.3 Hydrological Conditions, Including for Each Aquifer in the Management Area the Total Estimated Recoverable Storage as Provided by the Executive Administrator, and the Average Annual Recharge, Inflows, and Discharge

The following is a discussion of GMA-9's consideration of this third factor identified in Subsection 36.108 (d) of the TWC to be discussed in the ER, and how the adopted DFCs for the Trinity and Edwards Group of the Edwards-Trinity (Plateau) aquifers impact this factor.

6.1.3.3.1 Total Estimated Recoverable Storage (Provided by TWDB)

GCDs are required to consider the TERS volume prior to determining a DFC. The TERS is defined as a porosity-adjusted volume of groundwater that might be recovered from the aquifer assuming 25 percent or 75 percent recovery. Realistically, the numbers should be considered as a very simplistic approach to determining an upper limit volume of available groundwater. The TERS volumes estimated for the Trinity Aquifer are included in **Table 43**. The TERS volumes for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer are presented in **Chapter 5.0** – GMA-9 PROPOSED NON-RELEVANT AQUIFER CLASSIFICATIONS, **Section 5.1.2.2**, Aquifer Characteristics, Groundwater Demands, Current Groundwater Uses, Including Total Estimated Recoverable Storage (TERS) of this ER.

Table 43. Trinity Aquifer – Total Estimated Recoverable Storage Amounts within GMA-9 (by Groundwater Conservation District)

GMA-9 GCD	Total Storage (ac-ft)	25% of Total Storage (ac-ft)	75% of Total Storage (ac-ft)
No GCD	910,000	227,500	682,500
BCRAGD	1,200,000	300,000	900,000
BSEACD	2,200	550	1,650
BPGCD	420,000	105,000	315,000
CCGCD	760,000	190,000	570,000
EAA	37,000	9,250	27,750
HTGCD	550,000	137,500	412,500
HGCD	340,000	85,000	255,000
MCGCD	370,000	92,500	277,500
TGRGCD	680,000	170,000	510,000
Totals	**5,269,200**	**1,317,300**	**3,951,900**

Source: Jones and Bradley, 2013

Estimates of average annual recharge, inflows, and discharge to springs and other waters were compiled from GAM runs that were performed to support the GCD management plans. For the Trinity Aquifer, these data are included as **Table 44**. For the Edwards Group of the Edwards-Trinity (Plateau) Aquifer, these estimates are shown in **Table 45**. The estimates used for Run 5 Scenario 6 for the Hill Country Trinity GAM for the Trinity Aquifer are summarized in **Table 46.**

Table 44. Trinity Aquifer Recharge, Inflows and Discharge to Other Waters within GMA-9

GMA-9 GCD	Estimated Annual Recharge from Precipitation (ac-ft/year)	Estimated Annual Volume Discharge to Springs and Surface Water (ac-ft/year)	Estimated Annual Volume Flow into District within Aquifer (ac-ft/year)	Estimated Annual Volume Flow Out of District within Aquifer (ac-ft/year)	Estimated Net Annual Flow between Aquifers in the GCD (ac-ft/year)
BCRAGD	23,480	17,781	20,094	24,360	332 (Edwards-Trinity to Trinity)
BPGCD	44,469	25,450	4,461	19,416	164 (Trinity to Edwards-Trinity)
CCGCD	48,037	29,249	7,908	30,880	6,414 (Edwards-Trinity to Trinity) 58 (Edwards Group into Trinity)
HTGCD	26,105	22,439	17,716	11,610	7,440 (Trinity to Edwards (BFZ))
HGCD	21,243	18,291	19,547	19,745	27,213 (Trinity to Edwards-Trinity)
MCGCD	6,918	6,412	24,023	23,176	N/A
TGRGCD	42,171	9,892	35,193	26,170	37,272 (Trinity to Edwards (BFZ))
Totals	**212,423**	**129,514**	**128,942**	**155,357**	**6,804 (into Trinity from Edwards-Trinity and Edwards Group)** **72,089 (from Trinity to Edwards (BFZ) and Edwards-Trinity)**

Source: TWDB Annual Aquifer Recharge From Precipitation, Volume of Water Discharging from Aquifers to Springs and Surface Water Bodies, Including Lakes, Streams, and Rivers, and Volume of Flow Into/Out of GCD Within Aquifers and Between Aquifers GMA-9 Groundwater Conservation District- (By GCD and Major Aquifer) September 28, 2015

Table 45. Edwards Group of the Edwards-Trinity (Plateau) Aquifer Recharge, Inflows and Discharge to Other Waters within GMA-9

GMA-9 GCD	Estimated Annual Recharge from Precipitation (ac-ft/year)	Estimated Annual Volume Discharge to Springs and Surface Water (ac-ft/year)	Estimated Annual Volume Flow into District within Aquifer (ac-ft/year)	Estimated Annual Volume Flow Out of District within Aquifer (ac-ft/year)	Estimated Net Annual Flow between Aquifers in the District (ac-ft/year)
BCRAGD	2,524	1,377	9,516	12,319	332 (Edwards-Trinity to Trinity)
BPGCD	571	0	0	204	164 (Trinity to Edwards-Trinity)
CCGCD	6,046	3,061	4,099	384	6,414 (Edwards-Trinity to Trinity)
HGCD	26,325	17,646	19,805	37,378	5,846 (Trinity to Edwards-Trinity)
Totals	**35,466**	**22,084**	**33,420**	**50,285**	**6,746 (into Trinity from Edwards-Trinity)** **6,010 (from Trinity to Edwards-Trinity)**

Source: TWDB Annual Aquifer Recharge From Precipitation, Volume of Water Discharging from Aquifers to Springs and Surface Water Bodies, Including Lakes, Streams, and Rivers, and Volume of Flow Into/Out of GCD Within Aquifers and Between Aquifers GMA-9 Groundwater Conservation District- (By GCD and Major Aquifer) September 28, 2015

Table 46. Trinity Aquifer GAM Task 10-005 Scenario 6 Water Budget Components (all estimates are average values)

County	Pumping (ac-ft/year)	Spring and River Base Flow (ac-ft/year)	Outflow Across the BFZ (ac-ft /year)	Edwards Group Drawdown after 50 (ac-ft/year)	Overall Trinity Drawdown after 50 years (ft)	Upper Trinity Drawdown after 50 years (ft)	Middle Trinity Drawdown after 50 years (ft)	Lower Trinity Drawdown after 50 years (ft)
Bandera	7,910	30,620	535	0.8	29.3	12.6	37.8	37.8
Bexar	24,856	10,319	28,131	n/a	46.0	15.1	58.6	58.6
Blanco	2,573	16,312	n/a	n/a	19.2	14.8	20.6	20.7
Comal	10,214	1,477	33,948	n/a	23.9	15.4	25.5	25.5
Hays	9,115	18,025	3,995	n/a	19.2	11.4	22.4	22.4
Kendall	11,450	24,753	n/a	2.0	28.6	26.3	29.3	29.4
Kerr	15,952	37,559	n/a	0.2	39.2	6.7	56.8	58.2
Medina	2,500	5,395	6,647	n/a	16.1	6.4	21.0	21.1
Travis	8,697	9,050	670	n/a	27.6	28.2	27.6	27.6
GMA-9	**92,261**	**150,359**	**50,163**	**0.5**	**29.8**	**13.9**	**36.4**	**36.7**

Source: Hutchison, 2010

6.1.3.3.2 Average Annual Recharge

The estimated average annual recharge for the Trinity Aquifer in GMA-9 is approximately 212,400 ac-ft/year. Most of this recharge is attributed to Kendall, Blanco, and a portion of Bexar counties. For the Edwards Group of the Edwards-Trinity (Plateau) Aquifer, it is estimated to be nearly 35,500 ac-ft/year, and most of this occurs in Kerr County.

Recharge for GAM Run 5 was based upon tree ring data and average precipitation. Numerous recharge estimates were utilized to calibrate the model based upon the potential variability inherent in the

precipitation-recharge relationship. Generally, recharge varied between 250,000 and 450,000 ac-ft/year depending on annual precipitation depths.

6.1.3.3.3 Inflows

Estimated annual inflows to the Trinity Aquifer within GMA-9 total nearly 129,000 ac-ft/year, and inflows to the Edwards Group of the Edwards-Trinity (Plateau) Aquifer are estimated to be just over 33,400 ac-ft/year. Approximately 6,800 ac-ft/year flows into the Trinity from the Edwards Group of the Edwards-Trinity (Plateau) within GMA-9, while close to 6,000 ac-ft/year flows from the Trinity into the Edwards Group of the Edwards-Trinity (Plateau) Aquifer.

6.1.3.3.4 Discharge

Discharge to springs and rivers via base flow are estimated at 129,500 ac-ft/year from the Trinity Aquifer within GMA-9, and just under 23,000 ac-ft/year from the Edwards Group of the Edwards-Trinity (Plateau) Aquifer. The HTC GAM Run 5 estimated spring and river base flow to be 150,300 ac-ft/year.

Run 5 estimated outflow across the BFZ to total nearly 50,200 ac-ft/year from GMA-9. Management plan estimates suggest 155,400 ac-ft/year flow out of GMA-9 within the Trinity Aquifer, and just over 50,200 ac-ft/year flows out of GMA-9 within the Edwards Group of the Edwards-Trinity (Plateau) Aquifer.

6.1.3.3.5 Impact of Trinity Aquifer DFC on Hydrological Conditions

Pumping under Run 5 was assigned to be near 92,000 ac-ft/year. Year 2008 estimates from the GCDs totaled about 60,000 ac-ft/year. The additional 32,000 ac-ft/year of pumping primarily impacts discharge to springs and rivers, with a reduction of 14,000 ac-ft/year. Impacts to outflow are also significantly impacted as a result of pumping set at 92,000 ac-ft/year. The increased pumping under Scenario 6 would result in a decrease of outflow across the BFZ of approximately 12,000 ac-ft/year. The model indicates that increased pumping would not impact the Upper Trinity as much as the Middle and Lower Trinity aquifers. This is likely due to buffering from recharge and the fact that it is the least utilized portion of the Trinity Aquifer system within GMA-9.

6.1.3.3.6 Impact of Edwards Group of Edwards-Trinity (Plateau) Aquifer DFC on Hydrological Conditions

The Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFC of zero drawdown, applicable only to Bandera and Kendall counties, will have no detrimental impact on the hydrogeological conditions of the aquifer. The DFC is intended to minimize impact upon flow to springs and base flow to streams that are primarily affected by pumping from exempt wells.

6.1.3.4 Other Environmental Impacts, Including Impacts on Spring Flow and Other Interactions between Groundwater and Surface Water

The following provides a discussion of GMA-9's consideration of this fourth factor identified in Subsection 36.108 (d) of the TWC to be discussed in the ER, and discussion of the Trinity and Edwards Group of the Edwards-Trinity (Plateau) aquifer DFCs impacts on this factor.

Subsections 36.1071(e) (3) (C) - (E) of the TWC requires that GCDs consider, among other factors, the annual amount of recharge to the aquifers, discharge from the aquifers to springs and any surface water bodies, including lakes, streams and rivers, and flow into and out of the GCD within each aquifer and between aquifers in the GCD, if a GAM is available, in developing their GMPs (TWC §§36.1071(e) (3) (C) - (E)). To comply with this requirement, the GCDs in GMA-9 all have adopted GMPs for their GCDs that include consideration of these three factors. These estimates are prepared for the GCDs by the TWDB as part of an information packet used by the GCDs to update their GMPs every five years.

On September 28, 2015, GMA-9 received, and considered, a listing that contained detailed tables with annual aquifer recharge from precipitation, volume of water discharging from aquifers to springs and surface water bodies, including lakes, streams, and rivers, and volume of flow into/out of the GCDs within aquifers and between aquifers for GMA-9 GCDs and those counties or portions of counties within GMA-9. A copy of the list presented to GMA-9 on September 28, 2015 titled *Annual Aquifer Recharge From Precipitation, Volume of Water Discharging from Aquifers to Springs and Surface Water Bodies, Including Lakes, Streams, and Rivers, and Volume of Flow Into/Out of GCD Within Aquifers and Between Aquifers GMA-9 Groundwater Conservation Districts (By GCD and Major Aquifer)* is located in the GMA-9 files maintained in the BPGCD offices.

Also, please see previous related discussion of hydrologic conditions under **Subsection 6.1.3.3**, Hydrological Conditions, Including for Each Aquifer in the Management Area the Total Estimated Recoverable Storage as Provided by the Executive Administrator, and the Average Annual Recharge, Inflows, and Discharges of this ER.

6.1.3.4.1 Spring flow and Groundwater/Surface Water Interaction Considerations in GMA-9

Protection of spring flow and base flows has been a primary consideration for GMA-9 in joint planning since joint planning was initiated in 2005. During the first round of planning, protecting spring flow was one of the key considerations for GMA-9 in response to public input. GMA-9 asked the TWDB to conduct some GAM runs to evaluate the feasibility of maintaining 90 percent of spring flow during drought years as the DFC. The modeling indicated that spring flow could not be maintained during drought years, even with zero pumping. GMA-9 determined that any DFC based on maintaining or restoring spring flow could not be achieved through any designated DFC. Additionally, GMA-9 determined that protection of spring flow was best left to local GCDs who could promulgate rules and management plans to address local spring-related issues.

Three petitions were filed challenging the "reasonableness" of the DFC GMA-9 initially set for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer. Among their claims, the petitioners' asserted that GMA-9

should have reviewed and considered other models, spring flow studies, and other entities' data; that spring flow should have been the focus of the DFC and not "drawdown"; and the DFC did not protect base flow/spring flow because the DFC could not be enforced. GMA-9 responded that there was widespread support expressed to protect springs, creeks, and rivers, the Committee set the DFC to provide a minimal MAG quantity for growth and to protect spring flows, and the Committee considered Region J's groundwater availability numbers but other considerations were more important. In their analysis of these petitions, the TWDB staff stated that the parties appeared to agree that maintaining spring flow was a priority, and that both parties' conditions protected spring flow by discouraging non-exempt use; with the Region J goal allowing "acceptable" impact to the aquifer (TWDB, 2012a).

Two other petitions were later filed challenging the reasonableness of the DFC GMA-9 adopted for the Trinity Aquifer. One of the petitions claimed the DFC was unreasonable because of concerns regarding Jacob's Well and other Hays County springs, reduced instream flows to protect aquatic habitat, impacts on Barton Springs and the economic burden on Edwards Aquifer downstream users to maintain target flows in critical springs, and failure of the DFC to articulate the DFC during drought.

In response to these claims, GMA-9 stated that even during the worst one-year drought there was water at ground level in Jacob's Well, levels in wells close to Jacob's Well had not varied more than a few feet in the past eight – ten years, a drop of two to three feet caused Jacob's Well to stop flowing and that drop could be caused by a lack of substantial recharge during drought and continued drilling and pumping from new, exempt wells.

GMA-9 further reiterated that to protect spring flow, base flows should be protected. To protect spring flow from increased pumping, GMA-9 set a DFC for the Trinity Aquifer to help reduce resulting impacts from some increased pumping due to future growth. GMA-9 also pointed out that the challenge for GCDs with unique local conditions (e.g. Jacob's Well) was not the DFC, but how the MAG amounts were managed given the increases in pumping, especially from exempt wells, over time.

In the TWDB analysis of these challenges, the staff stated that assessing environmental impacts of the DFC was difficult because a number of factors affect instream flows and outflows from the Trinity Aquifer, such as pumping and rainfall. The Committee also noted the DFC may reduce flows across the interface, but because these flows to the Edwards Aquifer were only ten percent of the total from various sources the potential impact was not reasonably expected to be as great as the petitioner was suggesting. The TWDB staff noted that each GCD was responsible for implementing the DFCs in their GMPs, and for responding to GCD-specific issues. GMA-9 and the GCDs should remain aware of technical work being conducted, and incorporate new data into joint planning efforts as it became available. The staff noted there was no requirement that a DFC ensure the aquifer was managed sustainably, and the DFCs represented policy decisions by GCDs to balance the competing goals of conserving groundwater and using it to meet demands (TWDB, 2012a)

In summary, the TWDB staff recommended the board find the Trinity Aquifer DFC to be reasonable and stated that *"The reasonableness of the DFC with respect to socio-economic impacts, environmental impacts, and the exercise of personal property rights will depend on the way in which the Districts*

incorporate the MAG into their management plans and rules and make related decisions regarding permit authorizations and administration," (TWDB, 2012, p. 17).

GMA-9 collectively believes that implementation of the adopted DFCs and resulting MAGs lies solely within the purview of each respective GCD, and how the GCDs may choose to incorporate the MAGs into their management plans, rules and programs. The TWC and the TAC do not provide any detail or guidance regarding how the GCDs are to consider DFC impacts on this factor.

The GMA-9 GCDs continue to improve science, monitoring networks, data and information, and to develop and implement various management strategies and incentives, such as water conservation, reuse and rainwater harvesting, to further reduce aquifer demand and help to achieve the DFCs. As the GMA-9 GCDs move forward with efforts to manage their aquifers, the GCDs continue to consider potential DFC impacts to aquifer users, along with environmental and other impacts. Through mandatory joint planning, the GCDs can discuss new or emerging issues that may involve re-evaluating, re-considering and/or revising a DFC.

It is important to keep in mind that the DFC consideration and development process is iterative. Pursuant to Section 36.108 of the TWC, the GCDs are to propose DFCs no later than every five years, and to meet to consider the DFCs at least annually to collectively respond to changed circumstances, to consider potential impacts to factors, and to make adaptive management adjustments to either the DFCs or MAGs. This process, however, can be costly and time-consuming for GCDs.

The GMA-9 GCDs are actively engaged in management activities and programs designed to carry out their statutory missions and manage their respective aquifers. These various management strategies are aimed at addressing aquifer management issues while identifying ways to optimize use of these shared resources. Both the GCDs' enabling statutes and Chapter 36 of the TWC provide GCDs with the flexibility necessary to develop locally-responsive management programs and management strategies and incentives, such as management zones, water conservation, reuse and rainwater harvesting, to further reduce demand and help to achieve the DFCs, and to consider potential impacts.

6.1.3.4.2 Impact of Trinity Aquifer DFC on Other Environmental Impacts, Including Impacts on Spring Flow and Other Interactions between Groundwater and Surface Water

Please refer to related discussion above under **Subsection 6.1.3.3.5**, Impact of Trinity Aquifer DFC on Hydrological Conditions of this ER. It is difficult to assess the environmental impacts of the Trinity Aquifer DFC because a number of factors affect instream flows and outflows from the Trinity Aquifer, such as pumping and rainfall. While there may potentially be some environmental impacts perceived by some as negative that would result from the Trinity Aquifer DFC, there are potential positive impacts as well (e.g., actively planning for and managing the aquifer with a goal of maintaining water levels and spring flows).

Any management strategy or DFC other than prohibiting all pumping could have detrimental environmental impacts. However, significantly restricting or prohibiting well drilling and pumping would have negative impacts on private property rights. Therefore, this type of DFC would restrict GMA-9's ability to meet the "balance test" required of DFCs in Section 36.108 (d-2) of the TWC. By setting a DFC for the Trinity Aquifer that protects spring flow, meets current demand and provides some water availability for growth,

GMA-9 believes the Trinity Aquifer DFC meets the "balance test" prescribed by Subsection 36.108 (d-2) of the TWC, and recognizes the "balance test" affirmed by the Texas Supreme Court's ruling in the *Edwards Aquifer Authority and State of Texas v. Burrell Day and Joel McDaniel* case regarding groundwater ownership and management.

GMA-9 contends that the challenge for GCDs with unique local conditions is not the DFC, but how the MAG amount is managed over time given increases in pumping, especially from exempt wells. The DFCs are long-term in nature, and allow GCDs to develop and implement management strategies and incentives (e.g. water conservation, reuse, and rainwater harvesting) to further reduce demand and help to achieve the DFC.

6.1.3.4.3 Impact of Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFC on Other Environmental Impacts, Including Impacts on Spring Flow and Other Interactions between Groundwater and Surface Water

Please refer to related discussion above under **Subsection 6.1.3.3.6**, Impact of Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFC on Hydrological Conditions of this ER. As with the Trinity Aquifer DFC, it is difficult to assess the environmental impacts of the Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFC because a number of factors affect instream flows and outflows from this aquifer, such as pumping and rainfall. While there may potentially be some environmental impacts perceived by some as negative that would result from the Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFC, there are potential positive impacts as well (e.g., actively planning for and managing the aquifer with a goal of maintaining water levels and spring flows).

Any management strategy or DFC other than prohibiting all pumping could have detrimental environmental impacts. However, significantly restricting or prohibiting well drilling and pumping would have negative impacts on private property rights. Therefore, this type of DFC would restrict GMA-9's ability to meet the "balance test" required of DFCs in Section 36.108 (d-2) of the TWC.

By setting a DFC for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer that maintains spring flow and base flow to creeks and rivers close to current average conditions, meets current demand and provides some water availability for additional future demand, GMA-9 believes the Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFC meets the "balance test" prescribed by Subsection 36.108 (d-2) of the TWC, and recognizes the "balance test" affirmed by the Texas Supreme Court's ruling in the *Edwards Aquifer Authority and State of Texas v. Burrell Day and Joel McDaniel* case regarding groundwater ownership and management. GMA-9 contends that the challenge for GCDs with unique local conditions is not the DFC, but how the MAG amount is managed over time given increases in pumping, especially from exempt wells.

The DFCs are long-term in nature, and allow GCDs to develop and implement management strategies and incentives (e.g. water conservation, reuse, and rainwater harvesting) to further reduce demand and help to achieve the DFC. For example, the BCRAGD and the HGCD have rules in place prohibiting the completion of new non-exempt wells into the Edwards Group of the Edwards-Trinity (Plateau) Aquifer. The CCGCD's

rules not only prohibit new wells being drilled, but also provide for aquifer protection where springs issuing from the Edwards Group of the Edwards-Trinity (Plateau) Aquifer feed Boerne City Lake.

6.1.3.5 The Impact on Subsidence

The following is a discussion of GMA-9's consideration of this fifth factor identified in Subsection 36.108 (d) of the TWC to be discussed in the ER, and how the adopted DFCs for the Trinity and Edwards Group of the Edwards-Trinity (Plateau) aquifers impact this factor.

Land subsidence can be triggered by excessive pumping from an aquifer. Water level and pressure declines reduce the hydrostatic pressure within the aquifer system and subsequently increases the effective stress upon the aquifer materials. The increase in effective stress can exacerbate compaction of the materials in aquifers with compressible characteristics. Over time, this can cause land subsidence.

6.1.3.5.1 Trinity Aquifer and Edwards Group of the Edwards-Trinity (Plateau) Aquifer Formations and Subsidence Considerations

A study of water level changes since pre-development (around the 1880s) in the Woodbine, Paluxy and Trinity Aquifers in North Central Texas (Mace et al., 1994) considered whether extreme water level declines in these aquifers could have initiated subsidence. The study found that based on historical geodetic survey data, no detectable land subsidence had occurred in the region to the south of the Dallas – Ft. Worth area. Any subsidence that might have occurred would have been below the precision level of the geodetic survey data, which is 0.2 ft.

6.1.3.5.2 Impacts of Trinity and Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFCs on Subsidence

The subsidence study considered water level declines ranging from 200 ft to 1,100 ft in the Trinity Aquifer and concluded that no measureable subsidence had occurred with such a significant decline in water levels. It is doubtful that a further decline of 30 ft would alter the results of this study. Although the study was not conducted within GMA-9, the study area was close enough in proximity to merit applicability to GMA-9, given that there are no known subsidence studies that have occurred within GMA-9.

6.1.3.6 Socioeconomic Impacts Reasonably Expected to Occur

The following provides a discussion of GMA-9's consideration of this sixth factor listed in Subsection 36.108 (d) of the TWC to be discussed in the ER, and discussion of how the Trinity and Edwards Group of the Edwards-Trinity (Plateau) aquifer DFCs impact this factor.

6.1.3.6.1 Socioeconomic Considerations in State and Regional Water Planning, and Joint Planning Processes

Identifying and evaluating water supply needs is a critical component of the SWP. To that end, TWDB works to identify future water supply needs to understand *"how the needs for water could affect*

communities throughout the state during a severe drought and to plan for meeting those needs," (TWDB, 2012b).

At a regional scale, 31 TAC §357.11(j) requires that TWDB provide technical assistance to regional planning groups in assessing impacts of not meeting water needs: "*Upon request, the EA will provide available technical assistance to RWPGs, including on water supply and demand analysis, methods to evaluate the social and economic impacts of not meeting needs, and regarding drought management measures and water conservation practices."* When comparing water supplies and demands, 31 TAC §357.33 (c) requires that *"The social and economic impacts of not meeting water needs will be evaluated by RWPGs and report for each RWPA."* Lastly, 31 TAC §357.34 (d) (7) states that evaluations of potentially feasible water management strategies will include, among others, analysis of *"Consideration of third party social and economic impacts resulting from voluntary redistributions of water including analysis of third-party impacts of moving water from rural and agricultural areas."*

TWDB provided socioeconomic impacts analyses of projected water shortages to Regions J, K, and L in support of their 2011 RWPs. According to the 2011 *Lower Colorado Regional Water Plan*, 2011 *Plateau Regional Water Plan*, and 2011 *South Central Texas Regional Water Plan*, during severe drought irrigation, municipal, manufacturing, mining, and steam-electric water user groups would experience water shortages in the absence of new water management strategies. The TWDB socioeconomic analyses for these three RWPGs are located in the RWPs for these three regions (Lower Colorado Regional Water Planning Group, 2011; Plateau Water Planning Group, 2011; and South Central Texas Regional Water Planning Group, 2011). It is important to note that these analyses are prepared toward the latter part of the RWP process after all water supply needs and potentially feasible water management strategies have been identified.

While these analyses are very important to the RWP and SWP processes, and provide extremely useful information for these defined purposes, these purposes are different than the directive provided to GMAs and GCDs in Subsection 36.108 (d) of the TWC. GCDs are required to consider the socioeconomic impacts reasonably expected to occur prior to adopting a proposed DFC, and then for a DFC that has been adopted, the ER (prepared in support of the GMA joint planning process) must document that the nine factors were considered and discuss how the adopted DFC impacts each factor (TWC §§36.108 (d) and (d-3)).

Although the TWDB provides detailed assessments of socioeconomic impacts associated with not meeting projected water needs in both the RWPs and SWP, these analyses *do not* address the potential costs or social impacts associated with establishing DFCs at the GMA level. Again, DFCs are defined as *"a quantitative description, adopted in accordance with Section 36.108, of the desired future condition of the groundwater resources in a management area at one or more specified future times,"* (TWC §36.001 (30)). The DFCs are regional and longer-term in nature – they are an important water management planning element.

DFCs are intended to function as a water planning goal for regional water planning and management and are used to develop MAG values. Because GMAs are still in the early rounds of establishing DFCs, there is a lack of historical data to thoroughly evaluate or quantify any potential impacts the DFCs may have had on economic or social patterns in the GMA-9 region since adoption. Additionally, because the DFCs are to

be reconsidered and proposed at least every five years, they are not easily evaluated as static values with clear short-term cost/benefit implications to the user community.

6.1.3.6.2 Socioeconomic Considerations in GMA-9

As stated previously, GCDs and GMAs are required to consider the socioeconomic impacts reasonably expected to occur prior to adopting proposed DFCs. As part of their continued efforts to meet the "balance test" described in Subsection 36.108 (d-2) of the TWC, GMA-9 considered socioeconomic impacts in both rounds of joint planning.

During the first round of joint planning, GMA-9 considered potential socioeconomic and other impacts related to adoption of the DFCs through extensive public outreach. GMA-9 held meetings across GMA-9's geographical boundaries to obtain stakeholder input from a variety of interest areas, such as recreation, real estate, commerce, irrigation and agriculture, political subdivisions, environmental groups, private property, tourism, and others. GMA-9 also participated in a policy research project with the University Of Texas LBJ School Of Public Affairs and the Jackson School of Geoscience that solicited and analyzed feedback on the Hill Country groundwater planning process and various issues, including socioeconomic considerations. GMA-9 considered all of this input when making these first-round DFC decisions.

For the three petitions filed with the TWDB challenging the "reasonableness" of the adopted Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFC, the petitioners asserted that the DFC was unreasonable because of the adverse socioeconomic impacts expected to occur as a result of the DFC and MAG. GMA-9 responded that setting a DFC involved determining the "desired future condition" of the aquifer and was a way of defining a management philosophy or approach to reach a desirable, achievable, and acceptable level of use of groundwater resources. The DFC was not a guarantee of social or economic stability, development opportunities, or prosperity. In response to a similar assertion that the adopted Trinity Aquifer DFC would have harmful economic impacts on spring flow and well use, GMA-9 stated that short-term fluctuations in water levels in private wells were not a direct result of the DFC itself, but more the result of localized pumping demands, weather patterns, and hydrogeological characteristics. GMA-9 explained that the DFC was a descriptive term describing the maximum average lowering of water levels that would be desirable or acceptable over the next 50 years of projected use and growth. In response to other claims that the DFC failed to consider environmental and economic impacts related to changes in surface water flows that would result from lowered aquifer levels, GMA-9 noted that one of the primary considerations that played heavily into the setting of the Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFC was the widespread support and almost universal insistence to protect base flow to springs, creeks, and rivers and this DFC provided a balance between the highest practicable level of groundwater production and the conservation, preservation, protection, recharging, and prevention of waste of groundwater in the management area.

In the TWDB's analysis of the petitions, they concluded that neither petitioner provided substantial evidence to show that any user or user group had been unreasonably harmed by the DFC. The TWDB staff report states that *"economic impacts of different pumping scenarios are difficult to quantify. Reduced water levels and outflow to surface water caused by natural events, such as a period of drought, or increases in*

population with concomitant increases in pumping may result in economic impacts. But economic impacts may also occur from limiting pumping of groundwater that would otherwise be put to beneficial use," (TWDB, 2012a, pp. 8-9). They went on to conclude that *"a regional DFC is not inherently unreasonable because it fails to adequately address special local issues better addressed by the local district through is management plan, rules, and site-specific information appropriate to individual permit applications,"* (TWDB, 2012a, p. 10).

6.1.3.6.3 Impacts of Trinity and Edwards Group of the Edwards-Trinity Plateau Aquifer DFCs on Socioeconomic Impacts Reasonably Expected to Occur

It is difficult to assess direct socioeconomic impacts likely to occur for the Trinity and Edwards Group of the Edwards-Trinity (Plateau) aquifer DFCs. These regional DFCs are important variables in establishing a framework for setting long-term water management programs and practices, and considering outcomes, but they are not the singular factor in evaluating potential economic or social impacts of water planning on the user community. Other factors, including drought and demographic shifts, are equally influential to the economic and social outcomes of water management practices. Localized implementation of water management initiatives at the GCD level may be more likely to result in direct economic impacts on the user community. At that level, GCDs may be better positioned to anticipate and address these issues through program implementation.

Based on previous groundwater management experiences, GMA-9 GCDs suggest that short-term fluctuations in water levels in private wells are not the direct result of the DFC statement itself, but more the result of localized pumping demands, weather patterns and hydrogeological characteristics. GMA-9 contends that the challenge for GCDs with unique local conditions is not the DFC, but how the MAG amount is managed over time given increases in pumping, especially from exempt wells. The DFC is also not a guarantee of social or economic stability, development opportunities or prosperity to any user. There would not be any impacts to exempt well owners as they are only required to register their wells, and most do not pay fees.

GMA-9 has and will continue to consider socioeconomic impacts while moving forward in the joint planning process, as more data and information regarding how DFCs are being implemented at the local level becomes available. GMA-9 GCDs will continue to work with their various communities and users to be better able to anticipate potential socioeconomic impacts.

By setting a DFC for the Trinity Aquifer that protects spring flow, meets current demand and provides some water availability for growth, GMA-9 believes the Trinity Aquifer DFC meets the "balance test" prescribed by Subsection 36.108 (d-2) of the TWC, and recognizes the "balance test" affirmed by the Texas Supreme Court's ruling in the *Edwards Aquifer Authority and State of Texas v. Burrell Day and Joel McDaniel* case regarding groundwater ownership and management.

By setting a DFC for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer that maintains spring flow and base flow to creeks and rivers close to current average conditions, meets current demand and provides some water availability for additional future demand, GMA-9 believes the Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFC meets the "balance test" prescribed by Subsection 36.108 (d-2) of

the TWC, and recognizes the "balance test" affirmed by the Texas Supreme Court's ruling in the *Edwards Aquifer Authority and State of Texas v. Burrell Day and Joel McDaniel* case regarding groundwater ownership and management.

6.1.3.7 The Impact on Interests and Rights in Private Property, Including Ownership and The Rights of Management Area Landowners and Their Lessees and Assigns in Groundwater as Recognized Under Section 36.002 (of the Texas Water Code)

The following provides a discussion of GMA-9's consideration of this seventh factor identified in Subsection 36.108 (d) of the TWC to be discussed in the ER, and discussion of the Trinity and Edwards Group of the Edwards-Trinity (Plateau) aquifer DFCs impacts on this factor.

As a reminder, Section 36.002 of the TWC states that a property owner has a vested ownership interest in, and the right to produce, the groundwater below the surface of their property. This section of the TWC does not prohibit a GCD from limiting or prohibiting a landowner from drilling a well for failure or inability to comply with the GCD's well spacing or tract size requirements, affect the GCD's ability to regulate groundwater production under the permits for wells and permit amendments, regulation of spacing and production, or transfer of groundwater out of the GCD sections of the TWC or the GCD's enabling act, or require that a GCD rule allocate to each landowner a proportionate share of groundwater available from an aquifer based on the number of surface acres owned by the land owner (TWC §36.002).

6.1.3.7.1 Recent Developments Regarding Consideration of Private Property Rights Related to Groundwater Management

Recent legal and legislative developments have highlighted the issue of ownership of groundwater and private property rights as it relates to groundwater management and regulation, and in particular when this type of regulation may result in a "taking" of private property rights. The following section provides a summary of these developments that have occurred since the first round of joint planning was completed in September 2010.

Legal Developments

Edwards Aquifer Authority and the State of Texas v. Burrell Day and Joel McDaniel

A recent case that resolved the question of whether a landowner has a vested ownership interest in the groundwater beneath his or her land was the Texas Supreme Court case - *the Edwards Aquifer Authority and the State of Texas v. Burrell Day and Joel McDaniel*. In 2012, the Texas Supreme Court held that land ownership included an interest in the groundwater beneath the land surface, and that groundwater rights are property rights subject to the Texas Constitution and cannot be taken without adequate compensation. In the opinion, the Texas Supreme Court also recognized the provision in Section 36.0015 of the TWC that states that GCDs are the state's preferred method for managing groundwater (TWC §36.0015).

Edwards Aquifer Authority v. Glenn and JoLynn Bragg

In 2013, the Fourth Court of Appeals (in San Antonio) ruled in the *Edwards Aquifer Authority v. Glenn and JoLynn Bragg* case that the trial court at the state level properly determined that implementing the EAA Act resulted in a "taking" and further concluded that the trial court made an error in calculating the compensation owed to the Braggs for the "taking" of their property.

These two cases were based upon lawsuits resulting from permit decisions made by the EAA required by their enabling statute. The EAA enabling act (EAA Act) contains very specific language with regard to its permit program that left the agency very little latitude in reaching groundwater withdrawal permit decisions. The specific purpose of the EAA and permit language contained in the EAA Act were the result of Endangered Species Act litigation filed in 1991 by the Sierra Club to protect the threatened and endangered species in Comal and San Marcos springs. No other GCDs in the State of Texas were created for that purpose and are subject to similar challenging language. The language in Chapter 36 of the TWC provides GCDs with the flexibility to design and implement permit and management programs that are consistent with State law and the Texas Constitution, and are responsive to local conditions, circumstances, and needs, including the joint planning process.

Legislative Development

Senate Bill No. 332

In 2011, the Texas State Legislature passed S.B. No. 332 relating to ownership of the groundwater below the land surface, the right to produce that groundwater, and management of groundwater by the state. In the bill analysis for this legislation that amended Section 36.002 of the TWC, GCDs were again acknowledged to be the preferred method of groundwater management. The bill analysis also noted that recent court activity had called into question a landowner's interest in the groundwater below their land, and some GCDs argued that the landowner did not have a vested interest in the water below the surface until the water was captured. S.B. No. 332, as passed, established that a property owner had a vested ownership interest in, and the right to produce, the groundwater below the surface of their property, but did not require that a GCD rule allocate to each landowner a proportionate share of groundwater available from an aquifer based on the number of surface acres owned by the landowner (Senate Research Center, 2011).

6.1.3.7.2 Private Property Rights Considerations in GMA-9

As was mentioned earlier, the issue of private property rights impacts was raised early on in the initial GMA-9 joint planning process as a key concern, and GMA-9 carefully weighed this consideration along with other environmental and socioeconomic considerations in setting DFCs during the first round of planning. Even so, three petitions were filed challenging the "reasonableness" of the adopted DFCs for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer claiming GMA-9 did not give proper consideration to groundwater use, socioeconomic impacts expected to occur, or *impacts on private property rights*. In their analysis of these claims, TWDB determined that the petitioners did not provide sufficient evidence to demonstrate the DFCs negative impacts on these factors (TWDB, 2010).

Two additional petitions were later filed challenging the reasonableness of the adopted DFC for the Trinity Aquifer. Among other claims, one petitioner asserted the DFC was unreasonable because it would negatively impact private property rights based on the potential reduction to one of their production permits. The second petitioner claimed the DFC would increase pumping, thereby increasing the number of existing and operating wells that would go dry and increasing associated operating costs, decrease spring flow and reduce property values, and result in potential water quality concerns (TWDB, 2012a).

GMA-9 responded that any management strategy or scenario, other than unlimited pumping, could potentially have an impact on private property rights. Also, in developing the Trinity Aquifer DFC, GMA-9 based its decision on what was actually being pumped, as opposed to what could be pumped, as many permit holders were authorized to pump far more than they actually used. In addition, GMA-9 responded that short-term fluctuations in private water well levels were not the direct result of the DFC, but more likely the result of localized pumping demands, weather patterns and hydrogeological conditions. GMA-9 further responded that the DFC was a description of the maximum average lowering of water level fluctuations that would be desirable or acceptable over the next 50 years of projected use and growth (TWDB, 2012a).

The TWDB staff analysis concluded that neither petitioner provided substantial evidence to show that any user or user group had been unreasonably harmed by the DFC, and they highlighted the inherent conflict regarding groundwater management and private property rights protection that GCDs face. The TWDB staff noted that both of these petitioners represented interests in private property rights in groundwater, and GCDs must continually strike a balance between the interests that support adopting DFCs allowing for more drawdown of an aquifer to protect the rights of those who have permits, versus those who support adopting more restrictive DFCs that would allow for less drawdown to protect private exempt water wells. Increasing aquifer drawdown could potentially make less water available for all well users including exempt well owners, and decreasing aquifer drawdown could make less groundwater accessible to non-exempt well owners with permitted authorized use. As the TWDB staff noted in their conclusion, *"The question may be whether achieving the DFC adopted by the Districts in GMA-9 reasonably accommodates the needs of all groundwater users in the GMA,"* (TWDB, 2012a, p. 15).

Ultimately, the TWDB staff recommended their board find the Trinity Aquifer DFC adopted by GMA-9 to be reasonable, and stated in their recommendation that *"The reasonableness of the DFC with respect to socio-economic impacts, environmental impacts, and the exercise of personal property rights will depend on the way in which the Districts incorporate the MAG into their management plans and rules and make related decisions regarding permit authorizations and administration,"* (TWDB, 2012a, p. 17).

DFCs are statements that represent a joint GMA expression of what they consider will be acceptable aquifer conditions at some future point in time. The DFC expressions are used to generate MAG quantities that support the regional and state water planning processes, and will help guide GCD aquifer management and permitting decisions. GMA-9 collectively believes that implementation of the adopted DFCs and resulting MAGs lies solely within the purview of each respective GCD, and how they may choose to incorporate the MAGs into their management plans, rules and programs. The TWC and the TAC do not provide any detail or guidance regarding how the GCDs are to consider DFC impacts on this factor.

It is important to keep in mind that the DFC consideration and development process is iterative. Pursuant to Section 36.108 of the TWC, the GCDs are to propose DFCs no later than every five years, and to meet to consider the DFCs at least annually to collectively respond to changed circumstances, to review GCD GMPs, to consider potential impacts to factors, and to make adaptive management adjustments to either the DFCs or MAGs. Through their management area joint planning efforts, GCDs can meet to discuss new or emerging issues that may require them to re-evaluate, re-consider and/or revise a DFC, and its resulting MAGs. This process, however, can be costly and time-consuming for GCDs.

The GMA-9 GCDs continue to improve science, monitoring networks, data and information, and to develop and implement various management strategies and incentives, such as water conservation, reuse and rainwater harvesting, to further reduce aquifer demand and help to achieve the DFCs. As the GMA-9 GCDs move forward with efforts to manage their aquifers, the GCDs continue to consider potential DFC impacts to aquifer users, along with private property rights and other impacts. Through mandatory joint planning, the GCDs can discuss new or emerging issues that may involve re-evaluating, re-considering and/or revising a DFC.

The GMA-9 GCDs are actively engaged in management activities and programs designed to carry out their statutory missions and manage their respective aquifers. These various management strategies are aimed at addressing aquifer management issues while identifying ways to optimize use of these shared resources. Both the GCDs' enabling statutes and Chapter 36 of the TWC provide GCDs with the flexibility necessary to develop locally-responsive management programs and management strategies and incentives, such as management zones, water conservation, reuse and rainwater harvesting, to further reduce demand and help to achieve the DFCs, and to consider potential impacts to key considerations, such as private property rights.

6.1.3.7.3 Impacts of Trinity Aquifer and Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFCs on Interests and Rights in Private Property, Including Ownership and Rights of Management Area Landowners and Their Lessees and Assigns in Groundwater as Recognized Under Section 36.002 (of the Texas Water Code)

Based upon the TWDB staff report noted above, GMA-9 notes that the impact of the Trinity and the Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFCs with regard to personal property rights will depend upon the way in which the GMA-9 GCDs incorporate the resulting MAGs into their GMPs and rules, and make related decisions regarding permits. Because of the inherent conflict in private property rights interests also noted above, it is important that GMA-9 established these DFCs to accommodate all groundwater users, and in doing so, strike the balance required by Section 36.108 (d-2) of the TWC. While some may view these two DFCs as having potentially negative impacts on private property rights, GMA-9 would also offer that there are positive implications for private property rights that result from setting regional, long-term goals to actively aid in planning for and managing these groundwater resources to provide all users with their fair share of groundwater, and to preserve these resources for the benefit of all who rely upon them.

Any management strategy other than allowing unlimited pumping would potentially have negative impacts on the private property rights of those seeking to pump more groundwater, and potentially beneficial private property rights impacts on small well owners seeking to produce water from the same aquifer. Unlimited

pumping would also have negative impacts on environmental and socioeconomic considerations as well. Therefore, this type of DFC would restrict GMA-9's ability to meet the "balance test" required of DFCs in Section 36.108 (d-2) of the TWC.

GMA-9 contends that the challenge for GCDs with unique local conditions is not the DFC, but how the MAG amount is managed over time given increases in pumping, especially from exempt wells. The DFCs are long-term in nature, and allow GCDs to develop and implement management strategies and incentives (e.g. water conservation, reuse, and rainwater harvesting) to further reduce demand and help to achieve the DFC. Again, localized implementation of water management initiatives at the GCD level may be more likely to balance private property rights impacts. At that level, GCDs may be better positioned to anticipate and address these issues through program implementation.

By setting a DFC for the Trinity Aquifer that protects spring flow, meets current demand and provides some water availability for growth, GMA-9 believes the Trinity Aquifer DFC meets the "balance test" prescribed by Subsection 36.108 (d-2) of the TWC, and recognizes the "balance test" affirmed by the Texas Supreme Court's ruling in the *Edwards Aquifer Authority and State of Texas v. Burrell Day and Joel McDaniel* case regarding groundwater ownership and management.

By setting a DFC for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer that maintains spring flow and base flow to creeks and rivers close to current average conditions, meets current demand and provides some water availability for additional future demand, GMA-9 believes the Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFC meets the "balance test" prescribed by Subsection 36.108 (d-2) of the TWC, and recognizes the "balance test" affirmed by the Texas Supreme Court's ruling in the *Edwards Aquifer Authority and State of Texas v. Burrell Day and Joel McDaniel* case regarding groundwater ownership and management.

6.1.3.8 The Feasibility of Achieving the Desired Future Condition

The following is a discussion of GMA-9's consideration of this eighth factor identified in Subsection 36.108 (d) of the TWC to be discussed in the ER, and how the adopted Trinity and Edwards Group of the Edwards-Trinity (Plateau) aquifer DFCs impact this factor.

The feasibility of achieving any particular DFC is not a static event in time or perpetual milestone that once surpassed remains constant. It is a condition that will evolve with the changing demands and hydrologic conditions of an aquifer system. Something that is feasible today may not be feasible ten years from now, due to the confluence of many variables beyond the control of those who make groundwater management decisions.

Chapter 36 of the TWC gives GCDs the authority to manage aquifers within their jurisdiction. As part of their efforts to manage these groundwater resources, the GCDs continue to collect water level data and meter data and expand existing monitoring networks in an effort to improve the science and knowledge required to continually evaluate hydrologic conditions, manage the groundwater resources and adapt to the ongoing challenges that may compromise DFC feasibility. One example is the implementation of monitoring plans and well networks to track the status of aquifer levels compared to the DFCs. Utilization

of the best available science and implementation of the tools necessary to assess compliance with DFC goals is critical to on-going assessment and achievement feasibility.

The DFCs are based on the best available science (through the use of the approved GAM or other quantitative tools) to determine whether they are physically possible, reasonable and achievable. Once adopted and submitted to the TWDB, they are used to determine the MAG amounts, and are then considered to be the maximum available groundwater supply for that aquifer for RWPG purposes only, and are used by the GCDs to manage their aquifers and to be considered as one of five factors in making decisions regarding permits.

Through joint planning efforts, the GCDs conduct joint groundwater planning that includes annual reviews of the DFCs and the GMPs. Also, to ensure coordination with other water planning efforts, the GCDs are voting members of the RWPGs. Lastly, the GCDs are also empowered with rule-making authority to implement and achieve the DFCs, authority to limit production and implement well spacing, and enforcement capabilities.

6.1.3.8.1 Trinity Aquifer and Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFCs Achievement Feasibility

The GCDs in GMA-9 authorized work to compare actual groundwater level data with model predictions made during the development of the DFC for the Trinity Aquifer in GMA-9 on a well-by-well basis. The analyses in this effort used simulated groundwater levels from the model files created for the evaluation of the DFC at the same locations as the wells that were monitored in 2009, 2010, and 2011. Simulated and measured groundwater elevations were compared at these discrete locations, and the analyses provided insight into the various assumptions that are embedded in the DFC.

The DFCs for the Trinity Aquifer and the Edwards Group of the Edwards-Trinity (Plateau) Aquifer were both assessed with appropriate GAMs and therefore, it is assumed that the DFCs are physically possible and achievable.

The GCDs that manage the Trinity Aquifer and the Edwards Group of the Edwards-Trinity (Plateau) Aquifer have the ability to develop rules and regulations to help manage use from the aquifers. Therefore, it is assumed that the DFCs are achievable from a regulatory perspective.

6.1.3.8.2 Impacts of Trinity Aquifer and Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFCs on DFC Achievement Feasibility

With diligent monitoring and expansion of toolsets and knowledge needed to manage aquifers, GMA-9 will be better able to assess challenges that may require DFC modification. If the DFCs become either too stringent (zero drawdown) or not conservative enough (30 ft), and become no longer feasible, the DFCs can be adjusted accordingly (toward more reasonableness) in future planning cycles.

6.1.3.9 Any Other Information Relevant to the Specific Desired Future Condition

The following provides a discussion of GMA-9's consideration of the ninth factor identified in Subsection 36.108 (d) of the TWC to be discussed in the ER, and discussion of the Trinity and Edwards Group of the Edwards-Trinity (Plateau) aquifer DFCs impacts on this factor.

The following considerations were provided by the GCDs within GMA-9 as either GCD-specific and/or local issues that may be impacted by these DFCs in this second round of planning.

6.1.3.9.1 Potential Large-Scale Pumping East of GMA-9 within Trinity Aquifer

Pumping within GMA 10, east of GMA-9 and within the (Middle) Trinity Aquifer, should be discussed and considered as a ninth factor. It is especially relevant to potential large-scale pumping along the eastern boundary of GMA-9.

GMA 10 is conducting an analysis of these potential pumping impacts on the Trinity Aquifer. GMA-9 continues to stay in communication with GMA 10 regarding the findings of their study. This other consideration noted may or may not affect GMA-9. If GMA-9 determines that it does, this issue will be discussed and considered during the next round of joint planning.

6.1.3.9.2 Drawdown from Contiguous, Unregulated Areas

With no GCD in western Travis County, neighboring wells have impacted the other GCDs' abilities to manage the DFC and MAG for the Trinity Aquifer. The Middle Trinity Aquifer is "de-watered" in northern Hays County at least partially because of major development in west Travis County.

This other consideration is partially covered by the previous discussion under **Subsection 6.1.3.9.1**, Potential Large-Scale Pumping East of GMA-9 within Trinity Aquifer of this ER. Other related comments noted in this discussion relate to other portions of the Trinity Aquifer that are either not under a GCD or under one that is in the initial stages of becoming operational.

6.1.3.9.3 Differences in Trinity Aquifer Hydrogeology

While all of the GCDs in GMA-9 rely on the Trinity Aquifer, the hydrogeologic properties of the aquifer in each GCD are not necessarily the same. Hays County geology and groundwater production, for example, is more similar to the Trinity Aquifer found in Comal, Travis and Blanco counties. These differences should be considered for DFC analysis. It may be more representative to break the Trinity Aquifer DFC into sections within GMA-9 rather than try and cover all cases with the same drawdown.

GMA-9 acknowledges that the Trinity Aquifer does not function the same across the geographic extent of GMA-9. In fact, GMA-9 has discussed dividing the Trinity Aquifer DFC into more than one DFC during the first and this second round of joint planning. The current HCT GAM contains different hydrologic characteristics built into the model's cells across the aquifer that cause it to act differently in various parts of GMA-9. The model would need to be improved and updated to develop technically-sound multiple DFCs for this aquifer. In addition, many model runs would be required to support sound and achievable DFCs.

GMA-9 is planning to work with the TWDB on updating the HCT GAM in the next round of planning, and this update will provide an opportunity to evaluate what would be necessary to improve the model's capabilities to analyze this issue further. GMA-9 will again consider this factor in the next round of joint planning.

6.1.3.9.4 Effects of City of Kerrville Aquifer Storage and Recovery Project on Trinity Aquifer

The City of Kerrville (COK) has a Conjunctive Use Permit for 4,423 ac-ft/year. During the last few drought years, the COK has pumped 1,200 to 1,400 ac-ft/year. During average weather conditions, the COK pumps 400 to 600 ac-ft/year. This spread between actual pumping and the MAG amount contributes to the HGCD's ability to operate well within its MAG amount for the Trinity Aquifer in Kerr County.

It would be beneficial to recognize the COK's Aquifer Storage and Recovery (ASR) Project and its related pumping in the context of the Trinity Aquifer DFC and this ninth factor discussion. The Lower Trinity is influenced by COK pumping, and injections into their ASR. The COK's ASR Project has a significant impact on the HGCD's Lower Trinity Aquifer monitor well average, as the water level drops significantly when the COK is cut-back from taking surface water from the Guadalupe River and they increase their Lower Trinity Aquifer groundwater pumping. There is possibly a benefit to consider that may occur when, as the drought lets up, the COK reduces it pumping of the Lower Trinity Aquifer and begins injecting water back into the Lower Trinity Aquifer through their two ASR wells. The HGCD has observed quick recovery of the aquifer levels when this occurs. This issue is unique to the HGCD in GMA-9. **Figure 24** shows a comparison of the COK's ASR Project and impacts on the Lower Trinity Aquifer, in and near the COK.

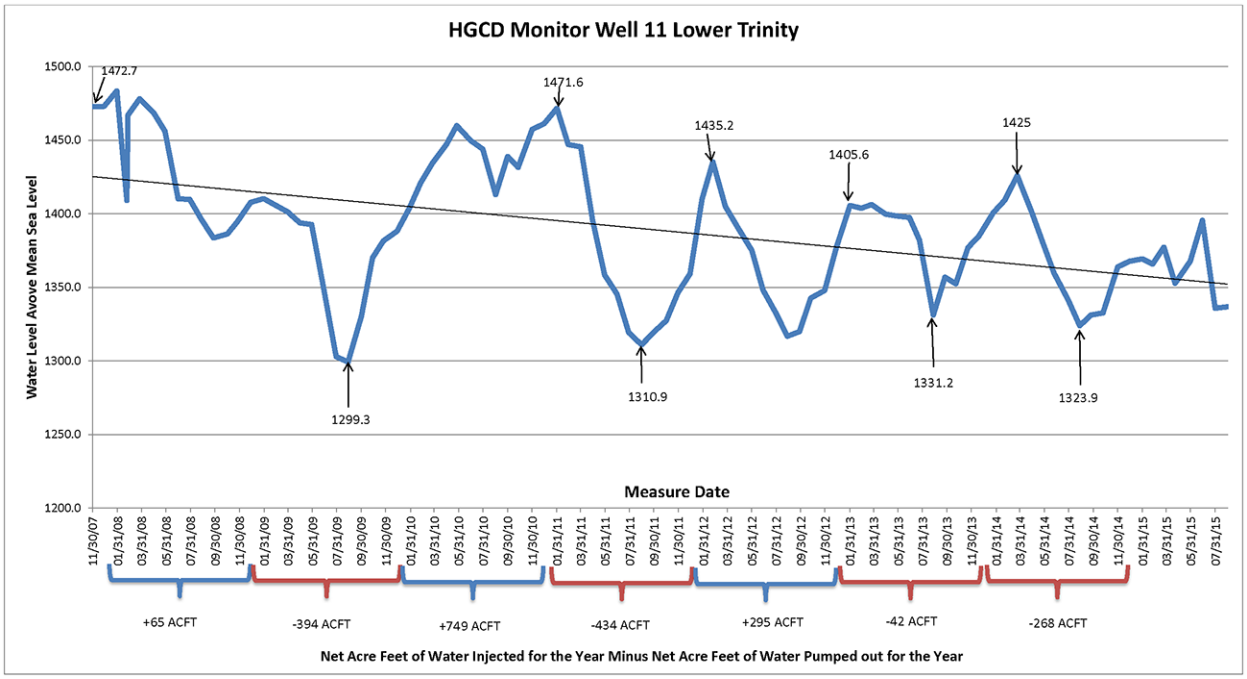

Figure 24. Comparison of City of Kerrville Aquifer Storage and Recovery Pumping to Lower Trinity Aquifer water levels in and near the City of Kerrville.

For Kerr County, the two main points to consider are: 1) in drought, the COK is likely to use the Lower Trinity Aquifer fairly significantly, and that may impact Middle Trinity Aquifer wells and the DFC; and 2) during times of plentiful rainfall when the COK is using surface water, they are also likely going to be injecting groundwater into their ASR. The COK's ASR may affect Kerr County Trinity Aquifer water levels both negatively and positively depending upon aquifer conditions. Overtime, it may affect the DFC. It is important to keep in mind that the DFC represents an average drawdown over a 50-year period for the entire aquifer, and between aquifer formations. Again, GMA-9 will continue to monitor this factor in coordination with the HGCD, and as more data and information become available, may consider it further in the next round of joint planning.

6.1.3.9.5 Targeted and Specific Exemptions that May Affect the Trinity Aquifer MAG

The enabling statutes for two GMA-9 GCDs contain targeted and specific exemptions that may create challenges with DFC and MAG compliance over the long-term. The TGRGCD enabling legislation contains an exemption for public water supply wells in place or with approved plans prior to the effective date of the act (September 1, 2001), to be exempt from the GCD's regulations. These well owners are required to pay fees and report their use to the GCD. Given the regulation exemption language, however, the TGRGCD is concerned there are numerous large-capacity wells throughout the GCD that meet this exemption and are currently not in use. However, if they are activated at some point in the future, these wells have sufficient production capacity that could cause the TGRGCD to exceed its Trinity Aquifer MAG.

TGRGCD staff is working with the TWDB to determine an exempt amount for the GCD that includes standard use exemptions provided for in Chapter 36 of the TWC, and these other exemptions provided for in their enabling act. Once they have these amounts, the TGRGCD can move forward with permitting other non-exempt wells. The GCD has monitor wells in place to measure water level drawdown.

In addition, the HTGCD's enabling legislation contains an exemption for agricultural use wells, which would not qualify as exempt wells under Chapter 36 of the TWC. Under Chapter 36, they would be regulated as non-exempt wells.

GMA-9 will continue to coordinate with the TGRCGD and HTGCD representatives on these developments, and as more data and information become available, may consider them further in the next round of joint planning.

6.1.3.9.6 Impacts of Trinity and Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFCs on Any Other Information Relevant to the Specific Desired Future Conditions

The comments and issues summarized above only relate to the Trinity Aquifer within GMA-9. The GCDs raise issues that could potentially be impacted by this DFC at some point in the future, beyond the current or second planning cycle. The potential for these and other changed circumstances to the extent they can be identified and quantified, could be considered in future joint planning efforts by GMA-9.

None of the comments or issued raised above relate to the Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFC. Therefore, no potential impacts have been identified.

6.1.4 Other DFCs Considered by GMA-9

Subsection 36.108 (d-3) (4) of the TWC requires that the ER, among other things, list other DFC options that were considered, if any, and the reasons why these other DFCs were not adopted (TWC §36.108 (d-3) (4). GMA-9 did not consider or discuss any other specific DFCs than the ones they adopted for the Trinity and Edwards Group of the Edwards-Trinity (Plateau) aquifers on April 18, 2016, during the second round of joint planning.

With regard to the Trinity Aquifer DFC, GMA-9 members had conceptual discussions about setting separate DFCs for the Middle Trinity and Lower Trinity aquifers. However, for the reasons discussed earlier in **Chapter 4.0** – GMA-9 JOINT PLANNING AND DESIRED FUTURE CONDITION DEVELOPMENT PROCESS, **Section 4.1**, Second Round of Joint Planning of this ER, GMA-9 decided to adopt only one DFC for the Trinity Aquifer.

6.1.5 Consideration of Recommendations Made by Others

Subsection 36.108 (d-3) (5) of the TWC requires that the ER also include a discussion of the reasons why recommendations made by either advisory committees and in relevant public comments received by the GCDs were or were not incorporated into the DFCs (TWC §36.108 (d-3) (5)). Some of the input GMA-9 GCDs received was in the form of a question rather than a comment on a specific DFC. Other input provided to either a GCD or GMA-9 was related to DFCs in general or an alternative DFC for either the proposed Trinity or Edwards Group of the Edwards-Trinity (Plateau) aquifer DFCs.

GMA-9 Chairman Ron Fieseler prepared a summary of these questions and comments (both oral and written) for GMA-9 consideration (**Appendix B**). This summary includes either a response by GMA-9 to the question, or a GMA-9 response to the comment that explains why it was or was not incorporated into the DFCs. The questions and/or comments were consolidated into similar comment groupings to allow for a more efficient review of the public comments. As stated in **Appendix B**, members of the GMA-9 ERLS met on two occasions in March 2016 to discuss and review the public comments prior to presenting them to the full GMA-9 joint planning committee for review and consideration.

6.2 Minor Aquifers: Ellenburger-San Saba and Hickory Aquifer Desired Future Conditions – Kendall County Only

The DFCs adopted by on April 18, 2016 by GMA-9 for the Ellenburger-San Saba and Hickory aquifers (**Table 30**) are the same ones contemplated during the first round of planning. As a reminder, GMA-9 also voted to propose classifying portions of the Ellenburger-San Saba and Hickory aquifers as non-relevant for the purposes of joint planning in Blanco, Hays, Kerr and Travis counties (**Table 16**). The non-relevant aquifer classification discussion is located under **Chapter 5.0 –** GMA-9 PROPOSED NON-RELEVANT AQUIFER CLASSIFICATIONS, **Subsection 5.2.1**, Ellenburger-San Saba Aquifer, and **Subsection 5.2.2**, Hickory Aquifer of this ER.

The following discussion provides GMA-9's policy and technical justifications for these adopted DFCs, and how they satisfy the "balance test" outlined in Subsection 36.108 (d-2) of the TWC.

6.2.1 Policy and Technical Justifications – Ellenburger-San Saba and Hickory Aquifers

The following discussion sets out GMA-9's policy and technical justifications in the second round of joint planning for the Ellenburger-San Saba and Hickory aquifer DFCs (**Table 30**), GMA-9's policy and technical justifications during the first joint planning round, and how the adopted DFC for the Ellenburger-San Saba and Hickory aquifer DFCs achieve the "balance test" in Subsection 36.108 (d-2) of the TWC.

6.2.1.1 Second-Round of Joint Planning

In early 2013, GMA-9 began to discuss classifying certain aquifers as "non-relevant" in the second round of joint planning, including the Ellenburger-San Saba and Hickory aquifers. The GMA-9 Technical Committee proposed that the Ellenburger, Hickory, Marble Falls, and Upper Glen Rose aquifers be designated as "not relevant" for regional groundwater planning purposes within GMA-9. This proposal would have reiterated GMA-9's November 30, 2009 action in the previous joint planning round, but would have made them non-relevant throughout GMA-9, including in Blanco County where a DFC had previously been adopted. This discussion occurred in GMA-9 meetings in 2013 and 2014.

In anticipation of this discussion and possible decision, on March 21, 2013, the BPGCD Board of Directors approved a resolution asking that the "GMA-9 Committee consider declaring the Ellenburger, Hickory, Marble Falls, and Upper Glen Rose aquifers "Not Relevant" for regional groundwater planning purposes within GMA-9" for the reasons considered in the first round and noted below, and other reasons such as concerns about the new requirements of Section 36.108 of the TWC and associated potential complexities and related expenses (Fieseler and Mathews, 2013).

Those GMA-9 members supporting this possible action also pointed to: 1) the lack of a significant regional basis, interaction, availability or accessibility of the Ellenburger-San Saba or Hickory aquifers throughout GMA-9 except in Blanco County, which was limited; 2) the largest Ellenburger permitted well in Blanco County was owned by Johnson City and it was regulated by the TCEQ and the BPGCD, and with this exception most of the production from these aquifers was from exempt wells; 3) the fact that no groundwater availability models existed for the Ellenburger and Hickory aquifers, and only two-dimensional spreadsheet calculations were used, which were very localized; 4) the fact that "non-relevant" aquifers could still be managed locally by the individual GCDs; and 5) the GCDs might avoid certain complex, time-consuming and costly tasks required by Chapter 36 of the TWC by declaring these aquifers as "not-relevant." Some of these points were also considered during the first round of planning, and are discussed below. Other points in favor of this position were the small groundwater availability amounts for these aquifers generated during the first joint planning round, the lack of producing wells, and the likelihood of actual future production.

In addition, GMA-9 members reiterated that declaring an aquifer "non-relevant" only had meaning for regional groundwater planning purposes and did not mean that the aquifer would be considered non-relevant for local GCD purposes. If a local aquifer was declared non-relevant and no MAG amount was available, the groundwater availability for that aquifer would be determined by the local GCD working cooperatively with the RWPG to incorporate a realistic water availability quantity into the RWP. MAG quantities derived from the DFC process had to be accepted and used by the RWPGs, but there was less

certainty about whether the RWPGs would accept the local GCD recommendations. A small MAG amount may not be significant when comparing "water availability" to the "water demand" categories in the RWP. On April 14, 2014, GMA-9 adopted Resolution #041414-01 declaring these two aquifers, along with the Marble Falls Aquifer, to be "non-relevant" for regional groundwater planning purposes in Blanco County.

However, in response to the Technical Committee's proposed recommendation, the CCGCD requested GMA-9 continue considering all aquifers within GMA-9, including the Ellenburger-San Saba and Hickory aquifers, as "relevant" for regional groundwater planning purposes. The CCGCD reasoned that while several of the aquifers existed in some of the GCDs within GMA-9, were absent in others or had not yet been fully delineated in others, all of these aquifers were all valuable groundwater resources that should be considered in the DFC process, with the local GCD boards and GMA-9 fulfilling their responsibilities and ultimately weighing in as to what the available groundwater amounts should be for regional and state water planning purposes. To not do so, would result in GMA-9 "ceding" its authority and responsibility for groundwater planning to the RWPGs, who would then develop these amounts and place them into the regional and state water plans. They urged GMA-9 to continue working together as a collective body to set DFCs for these aquifers that would result in MAG amounts to become the responsibility of the local GCDs and their elected boards. With regard to potential increased expenses related to the "unfunded mandates" now required by Section 36.108 of the TWC, the CCGCD noted that as water policy would continue to evolve in Texas, the GCDs could pool their limited funding resources to accomplish their legislative mandates and not "cede" their responsibilities no matter how small the quantities of water (Fieseler and Mathews, 2013). The CCGCD also noted a Guadalupe-Blanco River Authority study that looked at some of the structures within the Ellenburger-San Saba Aquifer and its potential for an aquifer storage and recovery project.

In 2014, the CCGCD Board of Directors subsequently voted to request that all aquifers in Kendall County be considered "relevant." The primary reasons for the CCGCD board's request were that they wanted some say in regional planning considerations for these aquifers even if the MAG amounts were determined to be zero ac-ft, and they did not want these numbers to be generated by the RWPG. It was also the intention of the CCGCD to go through whatever technical process was required to set these DFCs, at the same time GMA-9 would consider DFCs for the other aquifers in the second round of joint planning.

The CCGCD request was then forwarded to each GMA-9 GCD board of directors for their consideration. On July 14, 2014, in recognition of local control and to achieve cooperation and consensus among the GCDs, GMA-9 unanimously voted to declare the Ellenburger and Hickory aquifers "relevant" in Kendall County. Both GMA-9 actions with regard to the BPGCD and CCGCD requests reflect the group's commitment to work together, respect local priorities, and find solutions that work for the good of each GCD and the region as a whole.

The DFCs adopted on April 18, 2016 for the Ellenburger-San Saba and Hickory aquifers in Kendall County are based on a long-term target (50-year time period). During the initial years after the DFC adoption (2016 -2020), the CCGCD will assess the water level changes that occur during this time period, and gather and review other data and information related to implementing the DFC, such as comparing actual groundwater

use to the MAG amounts for these aquifers. The members of GMA-9 believe it is beneficial to assess any DFC over a longer time period, and re-evaluate it during the next, or third, round of joint planning.

6.2.1.2 First-Round of Joint Planning

During the first round of joint planning, GMA-9 undertook detailed consideration of DFCs and non-relevant aquifer classifications that subsequently informed the second round of planning. Therefore, a summary of the first round of DFC adoptions is included as part of this ER.

When GMA-9 adopted these DFCs, GMA-9 recognized the general limitation of these aquifers to only Blanco County within GMA-9, and the following DFCs were recommended to GMA-9 based upon coordination with the Hill Country UWCD and the Hickory UWCD, both in GMA 7:

- Ellenburger Aquifer – Allow for an increase in average drawdown of no more than 2 ft;
- Hickory Aquifer – Allow for an increase in average drawdown of no more than 7 ft; and
- Marble Falls Aquifer – Allow for no net increase in average drawdown.

The rationale for these GMA-9 actions was generally based upon:

- No known groundwater production from either the Ellenburger-San Saba or Hickory aquifers in Kendall or Kerr counties. Those aquifers involved such small quantities and are at such great depths that they are not economically viable or likely to be developed in either of these two counties.
- Blanco County was the only county in GMA-9 with manageable quantities of Ellenburger or Hickory groundwater production, and that only occurred in the northwestern portion of Blanco County.
- The largest Ellenburger-San Saba permitted well system (only 150 ac-ft per year) in Blanco County was owned by Johnson City, and this public water supply system was regulated by both the TCEQ and the BPGCD. Except for a few small-volume permitted wells, the rest of the Ellenburger Aquifer production was from exempt domestic and/or livestock watering wells.
- Production from Hickory Aquifer wells in Blanco County was almost all for exempt use. There were a few non-exempt wells that pump into ranch ponds, and even those were generally located on large ranch tracts and have little or no off-site effects.
- Blanco County had perhaps less than a dozen wells producing from the Marble Falls Aquifer and those were all exempt wells.
- Because of the aquifers' geological and hydrogeological characteristics, none of the production from the Ellenburger-San Saba, Hickory, or Marble Falls aquifers had any effect on the other GCDs within GMA-9.
- At their November 30, 2009 meeting, GMA-9 voted unanimously to declare the Ellenburger-San Saba, Hickory, and Marble Falls aquifers to be not relevant for areas of GMA-9 outside of Blanco County.

Therefore, while portions of these aquifers might be significant in some areas within the BPGCD, they were clearly not relevant for regional groundwater management and planning purposes. GMA-9 believed the

local relevance and management of these aquifers would be best addressed by the local GCDs through their rules and GMPs. Both of these documents could then be provided to the applicable RWPGs to be incorporated into their RWPs.

6.2.1.3 Groundwater Availability Model (GAM) Considerations

Based upon these adopted DFCs, the TWDB calculated the following "Managed Available Groundwater" amounts for the Ellenburger-San Saba and Hickory aquifers:

Ellenburger:	Blanco County	2,661 ac-ft
	Kendall County	9 ac-ft
	Kerr County	6 ac-ft
Hickory:	Blanco County	1,163 ac-ft
	Kendall County	2 ac-ft
	Kerr County	4 ac-ft

These groundwater availability amounts were issued by the TWDB in GTA Aquifer Assessment 08-09 (Ellenburger Aquifer) (Bradley, 2009a), and GTA Aquifer Assessment 08-10 (Hickory Aquifer) (Bradley, 2009b).

On June 22, 2011, the TWDB re-stated the MAG amounts for these aquifers for Blanco County in the amounts listed above in reports GTA Aquifer Assessment 10-01 MAG (Ellenburger Aquifer) (Bradley, 2011a), and GTA Aquifer Assessment 10-02 MAG (Hickory Aquifer) (Bradley, 2011b).

6.2.1.4 Achieving Subsection 36.108 (d-2) of the TWC "Balance Test" – Ellenburger and Hickory Aquifer DFCs

While the potential groundwater availability amounts resulting from these Ellenburger and Hickory aquifer DFCs in Kendall County may be small amounts, GMA-9 supports the CCGCD in their efforts to balance this possible groundwater production with efforts to conserve, preserve, and protect those water resources. The resulting MAGs may also inform the RWP process, and allow the CCGCD to manage and monitor these resources in a manner, that from a policy perspective, is important to the citizens of Kendall County.

For these policy and technical reasons, GMA-9 adopted the DFCs for the Ellenburger-San Saba and Hickory aquifers as stated in **Table 29**.

6.2.2 GMA-9 Section 36.108 (d) of TWC Factor Consideration, and Impacts of Ellenburger and Hickory Aquifer DFCs on Each Factor

As stated previously in **Chapter 3.0 –** STATUTORY AND REGULATORY REQUIREMENTS RELATED TO JOINT PLANNING AND DESIRED FUTURE CONDITIONS of this ER before GMA-9 could adopt any proposed DFCs, Section 36.108 (d) of the TWC requires that:

> *"(d) Not later than September 1, 2010, and every five years thereafter, the districts shall consider groundwater availability models and other data or information for the management area and shall*

propose for adoption desired future conditions for the relevant aquifers within the management area. Before voting on the proposed desired future conditions of the aquifers under Subsection (d-2), the districts shall consider:

(1) aquifer uses or conditions within the management area, including conditions that differ substantially from one geographic area to another;

(2) the water supply needs and water management strategies included in the state water plan;

(3) hydrological conditions, including for each aquifer in the management area the total estimated recoverable storage as provided by the executive administrator, and the average annual recharge, inflows, and discharge;

(4) other environmental impacts, including impacts on spring flow and other interactions between groundwater and surface water;

(5) the impact on subsidence;

(6) socioeconomic impacts reasonably expected to occur;

(7) the impact on the interests and rights in private property, including ownership and the rights of management area landowners and their lessees and assigns in groundwater as recognized under Section 36.002;

(8) the feasibility of achieving the desired future condition; and

(9) any other information relevant to the specific desired future conditions," (TWC §36.108 (d), p. 49).

Section 36.108 (d-3) goes on to state that:

"(d-3) After the earlier of the date on which all the districts have submitted their district summaries or the expiration of the public comment period under Subsection (d-2), the district representatives shall reconvene to review the reports, consider any district's suggested revisions to the proposed desired future conditions, and finally adopt the desired future conditions for the management area. The desired future conditions must be adopted as a resolution by a two-thirds vote of all the district representatives. The district representatives shall produce a desired future conditions explanatory report for the management area and submit to the development board and each district in the management area proof that notice was posted for the joint planning meeting, a copy of the resolution, and a copy of the explanatory report. The report must:

(1) identify each desired future condition;

(2) provide the policy and technical justifications for each desired future condition;

(3) include documentation that the factors under Subsection (d) were considered by the districts and a discussion of how the adopted desired future conditions impact each factor;

(4) list other desired future condition options considered, if any, and the reasons why those options were not adopted; and

(5) discuss reasons why recommendations made by advisory committees and relevant public comments received by the districts were or were not incorporated into the desired future conditions," (TWC §36.108 (d-3), p. 51).

As previously discussed in **Chapter 4.0 –** GMA-9 JOINT PLANNING AND DESIRED FUTURE CONDITION DEVELOPMENT PROCESS of this ER, on September 28, 2015, the members of GMA-9 received a detailed presentation on all of the nine factors as they related to DFCs in general, and the four being considered by GMA-9.

The following provides a discussion of GMA-9's consideration of each of the nine factor as they relate to the GMA-9 minor aquifer DFCs, and their impacts on each factor.

6.2.2.1 Aquifer Uses or Conditions within the Management Area, Including Conditions That Differ Substantially from One Geographic Area to Another

The following is a discussion of GMA-9's consideration of this first factor identified in Subsection 36.108 (d) of the TWC to be discussed in the ER, and how the adopted DFCs for the Ellenburger-San Saba and Hickory aquifers impact this factor.

6.2.2.1.1 GMA-9 Ellenburger-San Saba Aquifer Uses and Conditions

TWDB water use surveys for the year 2013 and exempt use estimates for 2015 indicate Ellenburger-San Saba Aquifer pumping only in Blanco County. No estimates were reported for any other counties in GMA-9 that overlie the Ellenburger-San Saba Aquifer.

6.2.2.1.2 GMA-9 Hickory Aquifer Uses and Conditions

TWDB water use surveys for the year 2013 and exempt use estimates for 2015 indicate pumping from the Hickory Aquifer only in Blanco County. No estimates were reported for any other counties in GMA-9 that overlie the Hickory Aquifer.

6.2.2.1.3 Impacts of Ellenburger-San Saba Aquifer and Hickory Aquifer DFCs on Aquifer Uses and Conditions

In Kendall County, DFCs of 2 ft and 7 ft have been adopted for the Ellenburger-San Saba and Hickory Aquifers, respectively. However, since no documented pumping occurs from these aquifers in Kendall County, the DFCs will have no impact on aquifer uses and conditions. The DFCs were adopted so that the

GCD would be able to retain its managerial jurisdiction even though the aquifers are not being utilized at present.

6.2.2.2 The Water Supply Needs and Water Management Strategies Included in the State Water Plan

The following is a discussion of GMA-9's consideration of this second factor identified in Subsection 36.108 (d) of the TWC to be discussed in the ER, and how the adopted Ellenburger-San Saba and Hickory aquifer DFCs impact this factor.

Subsection 36.1071(e)(4) of the TWC also requires that GCDs consider the water supply needs and water management strategies, included in the state water plan, among other considerations, in developing and adopting their GMPs (TWC §36.1071(e)). To comply with this requirement, the GCDs in GMA-9 all have adopted GMPs that include consideration of the water supply needs and water management strategies identified in the most recently adopted SWP that was in place at the time their management plans were adopted. Given the various GCD deadlines for adopting GMPs, this factor discussion focuses on the water supply needs and water management strategies contained in the 2012 SWP for those counties located within the GMA-9 GCDs.

6.2.2.2.1 2012 State Water Plan Water Supply Needs and GMA-9

For a complete discussion of GMA-9's consideration of this second factor – water supply needs and water management strategies included in the SWP – as it relates to water supply needs in the 2012 SWP and GMA-9, please refer to **Chapter 6.0** – GMA-9 DESIRED FUTURE CONDITIONS, **Subsection 6.1.3.2.1**, 2012 State Water Plan Water Supply Needs and GMA-9 of this ER.

On September 28, 2015, GMA-9 was provided with, and considered, a detailed listing of all water supply needs contained in the 2012 SWP for the counties covered by the GMA-9 GCDs within Regions J, K, and L. It is important to note that the water supply needs listed in the 2012 SWP include the entire county, and GMA-9 may not contain the entire county within its boundaries. The TWDB provides this and other statutorily-required data to the GCDs to prepare their updated GMPs. Some of this data is apportioned by formula to reflect district-specific information as required by the TWC. The water supply needs data, however, is provided on a county-wide basis because the GCDs are only required to consider the information in these tables (TWC §36.1071 (e) (4) and Allen, 2015a-i). A copy of the water supply needs list presented to GMA-9 on September 28, 2015 titled *2012 State Water Plan – Water Supply Needs GMA-9 GCDs and Counties (By GCD and County)* is located in the GMA-9 files maintained in the BPGCD offices.

6.2.2.2.2 2012 State Water Plan Water Management Strategies and GMA-9

For a complete discussion of GMA-9's consideration of this second factor – water supply needs and water management strategies included in the SWP – as it relates to water management strategies in the 2012 SWP and GMA-9, please refer to **Chapter 6.0** – GMA-9 DESIRED FUTURE CONDITIONS, **Subsection 6.1.3.2.2**, 2012 State Water Plan Water Management Strategies and GMA-9 of this ER.

On September 28, 2015, GMA-9 was provided with, and considered, a detailed listing of all water management strategies contained in the 2012 SWP for the counties covered by the GMA-9 GCDs within Regions J, K, and L. It is important to note that the water management strategies listed in the 2012 SWP include the entire county, and GMA-9 may not contain the entire county within its boundaries. The TWDB provides this and other statutorily-required data to the GCDs to prepare their updated GMPs. Some of this data is apportioned by formula to reflect district-specific information as required by the TWC. The water management strategies data, however, is provided on a county basis because the GCDs are only required to consider the information in these tables (TWC §36.1071(e) (4) and Allen, 2015a-i). A copy of the water management strategies list presented to GMA-9 on September 28, 2015 titled *2012 State Water Plan – Water Management Strategies GMA-9 GCDs and Counties (By GCD and County)* is located in the GMA-9 files maintained in the BPGCD offices.

6.2.2.2.3 Impacts of Ellenburger-San Saba and Hickory Aquifer DFCs on Water Supply Needs and Water Management Strategies Included in the State Water Plan

None of the water supply needs or management strategies in the 2012 SWP are related to either the Ellenburger-San Saba Aquifer or Hickory Aquifer in Kendall County. Therefore, it is highly unlikely these DFCs will impact the 2012 SWP.

6.2.2.3 Hydrological Conditions, Including for Each Aquifer in the Management Area the Total Estimated Recoverable Storage as Provided by the Executive Administrator, and the Average Annual Recharge, Inflows, and Discharge

The following is a discussion of GMA-9's consideration of this third factor identified in Subsection 36.108 (d) of the TWC to be discussed in the ER, and how the adopted DFCs for the Ellenburger-San Saba and Hickory aquifers impact this factor.

6.2.2.3.1 Total Estimated Recoverable Storage (Provided by TWDB)

For discussion of the TERS amounts provided for the Ellenburger-San Saba and Hickory aquifers, please refer to **Chapter 5.0** – GMA-9 PROPOSED NON-RELEVANT AQUIFER CLASSIFICATIONS, **Subsection 5.2.1.2**, Aquifer Characteristics, Groundwater Demands, Current Groundwater Uses, Including Total Estimated Recoverable Storage (TERS), and **Subsection 5.2.2.2**, Aquifer Characteristics, Groundwater Demands, Current Groundwater Uses, Including Total Estimated Recoverable Storage (TERS), respectively, of this ER.

6.2.2.3.2 Average Annual Recharge

Total annual effective recharge was estimated for the Ellenburger-San Saba Aquifer to be 2,586 ac-ft/year. This estimate is calculated by distributing the average effective recharge (2.0 percent) from annual precipitation (32 inches or 2.7 ft) across the extent of the outcrop (47,889 acres). This amount was calculated by TWDB as a part of Aquifer Assessment 10-01 MAG in June 2011 (47,889 acres *2.7 ft * 2.0 % = 2,586 ac-ft).

Total annual effective recharge was estimated for the Hickory Aquifer to be 899 ac-ft/year. This estimate is calculated by distributing the average effective recharge (2.7 percent) from annual precipitation (32 inches or 2.7 ft) across the extent of the Hickory outcrop (12,337 acres). This amount was calculated by TWDB as a part of Aquifer Assessment 10-02 MAG in June 2011 (12,337 acres *2.7 ft * 2.7 % = 899 ac-ft).

6.2.2.3.3 Inflows

No estimates of inflows to the Ellenburger-San Saba or Hickory aquifers from surface water flow across the outcrop or from adjacent subsurface formations have been calculated. Gain – loss studies conducted by the U.S. Geological Survey (Slade and others, 2003) along the Pedernales River have occurred across the outcrop of these aquifers in Burnet County, however, these aquifers do not outcrop in Kendall County.

6.2.2.3.4 Discharge

Estimates of discharge from the Ellenburger – San Saba Aquifer to springs and/or rivers via base flow have not been calculated for Kendall County, where aquifers likely do not have hydrogeological connectivity with surface water features.

6.2.2.3.5 Impacts of Ellenburger and Hickory Aquifer DFCs on Hydrological Conditions

In Kendall County, DFCs of two ft and seven ft have been adopted for the Ellenburger- San Saba and Hickory Aquifers, respectively. However, since no documented pumping occurs from these aquifers in Kendall County, the DFCs will have no impact on hydrological conditions. The DFCs were adopted so that the CCGCD would be able to retain its managerial jurisdiction even though the aquifers are not being utilized at present.

6.2.2.4 Other Environmental Impacts, Including Impacts on Spring Flow and Other Interactions between Groundwater and Surface Water

The following provides a discussion of GMA-9's considerations of this fourth factor identified in Subsection 36.108 (d) of the TWC to be discussed in the ER, and discussion of the Ellenburger and Hickory aquifer DFCs impacts on this factor.

As noted earlier in **Subsection 6.1.3.4**, Other Environmental Impacts, Including Impacts on Spring Flow and Other Interactions between Groundwater and Surface Water of this ER, Subsections 36.1071(e) (3) (C) - (E) of the TWC requires that GCDs consider, among other factors, the annual amount of recharge to the aquifers, discharge from the aquifers to springs and any surface water bodies, including lakes, streams and rivers, and flow into and out of the GCDs within each aquifer and between aquifers in the GCDs, if a GAM is available, in developing their GMPs (TWC §§36.1071(e) (3) (C) - (E)). To comply with this requirement, the GCDs in GMA-9 all have adopted GMPs for their GCDs that include consideration of these three factors. These estimates are prepared for the GCDs by the TWDB as part of an information packet used by the GCDs to update their GMPs every five years.

On September 28, 2015, GMA-9 received, and considered, a listing that contained detailed tables with annual aquifer recharge from precipitation, volume of water discharging from aquifers to springs and surface water bodies, including lakes, streams, and rivers, and volume of flow into/out of the GCDs within aquifers and between aquifers for GMA-9 GCDs and those counties or portions of counties within GMA-9. A copy of the list presented to GMA-9 on September 28, 2015 titled *Annual Aquifer Recharge from Precipitation, Volume of Water Discharging from Aquifers to Springs and Surface Water Bodies, Including Lakes, Streams, and Rivers, and Volume of Flow Into/Out of GLD Within Aquifers and Between Aquifers GMA-9 Groundwater Conservation Districts (by GCD and Major Aquifers)* is located in the GMA-9 files maintained in the BPGCD offices. That listing did not contain information related to the Ellenburger-San Saba and Hickory aquifers as GAMs had not been developed for these aquifers, as of the date of this ER's preparation.

6.2.2.4.1 Spring flow and Groundwater/Surface Water Interaction Considerations in GMA-9

For discussion regarding spring flow and groundwater/surface water considerations in GMA-9, please refer to **Subsection 6.1.3.4.1**, Spring flow and Groundwater/Surface Water Interaction Considerations in GMA-9 earlier in this ER.

6.2.2.4.2 Impacts of Ellenburger-San Saba and Hickory Aquifer DFCs on Other Environmental Impacts, Including Impacts on Spring Flow and Other Interactions between Groundwater and Surface Water

There are no known springs emanating from either the Ellenburger-San Saba and Hickory aquifers in Kendall County. The potential MAGs amounts resulting from the DFCs for the Ellenburger and Hickory aquifers in Kendall County will likely result in very small groundwater availability amounts. Also, since no documented pumping occurs from either of these aquifers in Kendall County, the DFCs will have no impact on this factor.

6.2.2.5 The Impact of Subsidence

The following is a discussion of GMA-9's consideration of this fifth factor identified in Subsection 36.108 (d) of the TWC to be discussed in the ER, and how the adopted DFCs for the Ellenburger-San Saba and Hickory aquifers impact this factor.

For a discussion about subsidence, please refer to **Subsection 6.1.3.5**, The Impact of Subsidence, earlier in this ER.

6.2.2.5.1 Ellenburger-San Saba Aquifer and Hickory Aquifer Formations and Subsidence Considerations

For discussion related to the Ellenburger and Hickory aquifer formations and subsidence, please refer to **Subsection 6.1.3.5.1**, Trinity Aquifer and Edwards Group of the Edwards-Trinity (Plateau) Aquifer Formations and Subsidence Considerations, earlier in this ER.

6.2.2.5.2 Impacts of Ellenburger-San Saba Aquifer and Hickory Aquifer DFCs on Subsidence

Based on the discussion of subsidence presented in **Subsection 6.1.3.5.2**, Impacts of Trinity Aquifer and Edwards Group of the Edwards-Trinity (Plateau) Aquifer DFCs on Subsidence, it is highly improbable that the DFCs of two ft and seven ft adopted for the Ellenburger- San Saba and Hickory Aquifers, respectively, in Kendall County will have any impact on any potential form of subsidence in central Texas.

6.2.2.6 Socioeconomic Impacts Reasonably Expected to Occur

The following provides a discussion of GMA-9's consideration of the sixth factor listed in Subsection 36.108 (d) of the TWC to be discussed in the ER, and discussion of how the Ellenburger and Hickory aquifer DFCs impact this factor.

6.2.2.6.1 Socioeconomic Considerations in State and Regional Water Planning, and Joint Planning Processes

For discussion of socioeconomic impacts as they relate to the state, regional and joint planning processes, please refer to **Subsection 6.1.3.6.1**, Socioeconomic Considerations in State and Regional Water Planning, earlier in this ER.

6.2.2.6.2 Socioeconomic Considerations in GMA-9

For discussion of socioeconomic factors in GMA-9, please refer to **Subsection 6.1.3.6.2**, Socioeconomic Considerations in GMA-9, earlier in this ER.

6.2.2.6.3 Socioeconomic Impacts Reasonably Expected to Occur, and Possible Impacts of Ellenburger-San Saba and Hickory Aquifer DFCs

It is difficult to assess direct socioeconomic impacts likely to occur for the Ellenburger-San Saba and Hickory aquifer DFCs since no documented pumping occurs from these aquifers in Kendall County. Localized implementation of water management strategies at the CCGCD level may be more likely to inform direct economic impacts on the user community once pumping from these aquifers begins to occur. At that level, GCDs may better positioned to anticipate and address these issues through program implementation.

These two DFCs were adopted so the CCGCD would retain managerial jurisdiction even though these aquifers are not currently being used. While the potential MAGs resulting from the application of these two DFCs to the Ellenburger and Hickory aquifers, respectively, in Kendall County may result in small groundwater availability amounts, GMA-9 supports the CCGCD in their efforts to balance this possible groundwater production with efforts to conserve, preserve, and protect these water resources.

6.2.2.7 The Impact on Interests and the Rights in Private Property, Including Ownership and the Rights of Management Area Landowners and Their Lessees and Assigns in Groundwater as Recognized Under Section 36.002 (of the Texas Water Code)

The following provides a discussion of GMA-9's consideration of this seventh factor listed in Subsection 36.108 (d) of the TWC to be discussed in the ER, and discussion of the Ellenburger-San Saba and Hickory aquifer DFCs impacts on this factor.

As a reminder, Section 36.002 of the TWC states that a property owner has a vested ownership interest in, and the right to produce, the groundwater below the surface of their property. This section of the TWC does not prohibit a GCD from limiting or prohibiting a landowner from drilling a well for failure or inability to comply with the GCD's well spacing or tract size requirements, affect the GCD's ability to regulate groundwater production under the permits for wells and permit amendments, regulation of spacing and production, or transfer of groundwater out of the GCD sections of the TWC or the GCD's enabling act, or require that a GCD rule allocate to each landowner a proportionate share of groundwater available from an aquifer based on the number of surface acres owned by the land owner (TWC § 36.002).

6.2.2.7.1 Recent Developments Regarding Consideration of Private Property Rights Related to Groundwater Management

For a discussion of recent developments related to consideration of private property rights in groundwater management, please refer to **Subsection 6.1.3.7.1**, Recent Developments Regarding Consideration of Private Property Rights Related Groundwater Management, earlier in this ER.

6.2.2.7.2 Private Property Rights Considerations in GMA-9

For discussion of private property rights considerations in GMA-9, please refer to **Subsection 6.1.3.7.2**, Private Property Rights Considerations in GMA-9, earlier in this ER.

6.2.2.7.3 Impacts of Ellenburger and Hickory Aquifer DFCs on Interests and Rights in Private Property, Including Ownership and Rights of Management Area Landowners and Their Lessees and Assigns in Groundwater as Recognized Under Section 36.002 (of the TWC)

It is difficult to assess private property rights impacts likely to occur for the Ellenburger-San Saba and Hickory aquifer DFCs since no documented pumping occurs from these aquifers in Kendall County. Localized implementation of water management strategies at the CCGCD level may be more likely to balance private property rights impacts on the user community as pumping from these aquifers begins to occur. At that level, the CCGCD may better positioned to anticipate and address these issues through program implementation.

The DFCs were adopted so that the CCGCD would be able to retain their managerial jurisdiction even though the aquifers are not being utilized at present. While the potential MAGs resulting from the application of these two DFCs to the Ellenburger-San Saba and Hickory aquifers, respectively, in Kendall County may result in small groundwater availability amounts, GMA-9 supports the CCGCD in their efforts

to balance this possible groundwater production with efforts to conserve, preserve, and protect these water resources.

6.2.2.8 The Feasibility of Achieving the Desired Future Condition

The following presents GMA-9's consideration of the eighth factor identified in Subsection 36.108 (d) of the TWC to be discussed in the ER, and discussion of the Ellenburger-San Saba and Hickory aquifer DFCs impacts on this factor.

For a discussion regarding the feasibility of achieving DFCs, please refer to **Subsection 6.1.3.8**, The Feasibility of Achieving the Desired Future Condition, earlier in this ER.

6.2.2.8.1 Ellenburger-San Saba Aquifer and Hickory Aquifer DFC Achievement Feasibility

The feasibility of these DFCs being achieved in Kendall County is essentially a non-issue until these resources are relied upon more consistently by the local users. From a practical standpoint, the monitoring well network will likely need only one or two wells to monitor these DFCs and verify DFC compliance.

6.2.2.8.2 Impact of Ellenburger-San Saba Aquifer and Hickory Aquifer DFCs on DFC Achievement Feasibility

The Hickory DFC aligns with GMA 7's Hickory Aquifer DFC that is also set at 7 ft. The Ellenburger- San Saba Aquifer DFC of 2 ft in GMA-9 is more conservative than GMA 7's DFC of 5 ft for this aquifer. It is unlikely that the DFCs will be impacted by any pumping in Kendall County in GMA-9, thus achievement of the DFC is feasible. Additionally, monitoring any potential impacts within GMA-9 as a result of GMA 7 pumping in Gillespie County is reasonable.

6.2.2.9 Any Other Information Relevant to the Specific Desired Future Condition

The following presents GMA-9's consideration of the ninth factor identified in Subsection 36.108 (d) of the TWC to be discussed in the ER, and discussion of the Ellenburger-San Saba and Hickory aquifer DFCs impacts on this factor.

6.2.2.9.1 Discussion of Other Considerations Relevant to Ellenburger-San Saba and Hickory Aquifer DFCs

As part of this second round of joint planning, considerations were provided by the GCDs within GMA-9, as either GCD-specific and/or local issues that may be impacted by these DFCs. None of the other factors or considerations raised by GMA-9 members pertained to either the Ellenburger-San Saba or Hickory aquifers.

6.2.2.9.2 Impacts of Ellenburger-San Saba and Hickory Aquifer DFCs on Other Factors

As noted above, no additional factors or considerations were noted by the GMA-9 GCDs. Therefore, no additional impacts for these DFCs have been identified.

6.2.3 Other DFCs Considered by GMA-9

Subsection 36.108 (d-3) (4) of the TWC requires that the ER, among other things, list other DFC options that were considered, if any, and the reasons why these other DFCs were not adopted (TWC §36.108 (d-3) (4)). GMA-9 did not consider or discuss any other specific DFCs other than the ones they adopted for the Ellenberger-San Saba and Hickory aquifers on April 18, 2016, during the second round of joint planning.

6.2.4 Consideration of Recommendations Made by Others

Subsection 36.108 (d-3) (5) of the TWC requires that the ER also include a discussion of the reasons why recommendations made by either advisory committees and in relevant public comments received by the GCDs were or were not incorporated into the DFCs (TWC §36.108 (d-3) (5)). Some of the input GMA-9 GCDs received was in the form of questions rather than comments on a specific DFC. Other input provided to either a GCD or GMA-9 was related to DFCs in general or an alternative DFC for the proposed Trinity Aquifer DFC. None of the questions or comments received by either a GCD or GMA-9 pertained to the proposed Ellenburger-San Saba or Hickory aquifer DFCs (**Appendix B**).

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Bluntzer, R. L. 1992. Evaluation of the groundwater resources of the Paleozoic and Cretaceous aquifers in the Hill Country of Central Texas: TWDB Report 339.

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Marble Falls Aquifer

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Appendix A

GMA-9 Joint Planning Meeting Documents – Required Actions

1.	September 28, 2015	BPGCD Posted Meeting Notice (Sample Notice) Minutes
2.	October 13, 2015	BPGCD Posted Meeting Notice (Sample Notice) Minutes
3.	April 18, 2016	BPGCD Posted Meeting Notice (Sample Notice) GMA-9 Resolution No. 041816-1 (Adopting the Groundwater Management Area 9 Joint Planning Committee's (GMA-9) Classifications of Non-Relevant Aquifers for Joint Planning Purposes and Desired Future Conditions for Relevant Aquifers in GMA-9)

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Groundwater Management Area 9 Joint Planning Committee Meeting

NOTICE OF OPEN MEETING

As required by Section 36.108(e), Texas Water Code, a meeting of the **Groundwater Management Area 9 Joint Planning Committee**, comprised of district representatives from the following groundwater conservation districts located wholly or partially within Groundwater Management Area 9: Bandera County River Authority and Groundwater District, Barton Springs/Edwards Aquifer Conservation District, Blanco-Pedernales Groundwater Conservation District, Comal Trinity Groundwater Conservation District , Cow Creek Groundwater Conservation District, Comal Trinity Groundwater Conservation District , Edwards Aquifer Authority, Headwaters Groundwater Conservation District, Hays-Trinity Groundwater Conservation District, Trinity-Glen Rose Groundwater Conservation District, and Medina County Groundwater Conservation District, will be held on **Monday, September 28, 2015, at 9:00 am at the Dripping Springs City Hall, 511 Mercer Street, Dripping Springs, Texas.**

Discussion and/or possible action may occur on the following business matters:

1. Call to Order.
2. Receipt of Posted Meeting Notices.
3. Introduction of the new Comal Trinity Groundwater Conservation District.
4. Other Introductions.
5. Approval of April 27, 2015 and June 8, 2015 GMA 9 Meeting Minutes.
6. Texas Water Development Board updates, comments, or communications.
7. Discuss GMA-9 current round of joint planning.
8. Present and discuss non-relevant aquifer classifications for purposes of joint planning.
9. Present and discuss desired future conditions being considered in current round of joint planning, including policy and technical justifications for each desired future condition.
10. Present and consider nine factors listed in Section 36.108 (d) of Texas Water Code.
11. Discuss and consider classifying portions or all of certain aquifers in GMA-9 as non-relevant for purposes of joint planning.
12. Discuss and consider adopting proposed desired future conditions (per Section 36.108 (d) of Texas Water Code).
13. Discuss and consider public comment process for desired future condition public hearings.
14. Reports on regional water planning activities by GMA 9 representatives to Regions J, K, and L.
15. Public Comment.
16. Next meeting date, location, and future agenda items.
17. Announcements.
18. Adjournment.

Further information, questions, or comments concerning any aspect of this meeting should be directed to:
Mr. Ron Fieseler, GMA 9 Planning Committee Chairman
c/o Blanco-Pedernales Groundwater Conservation District
601 West Main, P.O. Box 1516, Johnson City, TX 78636
(830) 868-9196 office, (830) 708-5020 cell, email to: manager@blancogw.org

Came to hand and posted on the bulletin board, and/or the _____, at the _____ County Courthouse, on this, the _____ day of _____, 2015 at _____ ( ) a.m. / ( ) p.m. by:

Printed Name _____

Signed, _____, _____ County, TEXAS

...or other currently used County Clerk Posting Stamp, Official Seal, posting procedure, or documentation.

FILED this 17th day of Sept 2015
LAURA WALLA 11:53 AM
County Clerk Blanco County, Texas
By Shelli Kmaly Deputy

Groundwater Management Area 9 Joint Planning Committee Meeting

Minutes

Monday, September 28, 2015—9:00 a.m.
Dripping Springs City Hall, 511 Mercer Street, Dripping Springs, Texas

1. Call to Order.

Ron Fieseler, GMA-9 Chairman, called the meeting to order at 9:01 a.m. He acknowledged that all GMA-9 Committee members were present except Bandera County River Authority and Groundwater (BCRAGD). At 9:17 am, BCRAGD Designated Representative Michael Redman and GMA-9 Secretary Morgen Ayers arrived.

2. Receipt of Posted Meeting Notices.

All GCDs posted the Meeting Agenda, but it was noted that BCRAGD posed the Agenda with the incorrect starting time rather than the corrected version.

3. Introduction of the new Comal Trinity Groundwater Conservation District.

Larry Hull, President of the CTGCD gave a short introduction to the new GCD, which is now a voting member of GMA-9. They are a non-taxing, fee-based District, serve all of Comal County, and have 7 Directors (3 at-large and 4 representing County Commissioner Precincts). They have developed a six month budget and will be working on Rules and setting up an office during the next few months.

Marc Friberg, attorney for the Edwards Aquifer Authority, noted that, as of September 1, 2015 due to recent legislation, the EAA will no longer be a voting member of GMA-9, but will continue to participate in GMA-9 regional planning.

4. Other Introductions.

The attending Board Presidents or Designated Representatives introduced themselves:

Medina County Groundwater Conservation District- David Caldwell, General Manager and DR
Headwaters Groundwater Conservation District- Gene Williams, General Manager and DR
Hays Trinity Groundwater Conservation District- Rick Broun, General Manager and DR
Bandera County River Authority and Groundwater District- Michael Redman, DR
Blanco-Pedernales Groundwater Conservation District- Ron Fieseler, P.G. General Manager and DR
Barton Springs/Edwards Aquifer Conservation District- Brian Hunt, P.G. and DR
Cow Creek Groundwater Conservation District- Micah Voulgaris, General Manager and DR
Trinity-Glen Rose Groundwater Conservation District- George Wissmann, General Manager and DR
Edwards Aquifer Authority- Julia Carrillo, DR
Comal Trinity Groundwater Conservation District, Larry Hull, Board President
Travis County (non-voting) Vicky Kennedy

5. Approval of April 27, 2015 and June 8, 2015 GMA-9 Meeting Minutes.

Postponed until the October 13, 2015 GMA-9 meeting.

6. Texas Water Development Board updates, comments, or communications.

Rima Petrossian of the TWDB gave updates, comments, or communications:

- Rima stated that there would be a TWDB Public Hearing on the definition of tributary aquifers. A survey will be available on the TWDB's website.
- Rima also stated that "exempt use estimates" are completed, and that they should be out by mail in the next couple of weeks. The TWDB would appreciate any feedback on these numbers.

7. Discuss GMA-9 current round of joint planning.

Velma Danielson of Blanton and Associates introduced herself, James Beach, and Jasmine Gardner as the consulting team working on the GMA-9 Explanatory Report. She explained that today's presentations would cover Agenda Items 7, 8, 9, and 10.

The following supplemental documents or PowerPoints were presented in power point presentations). The following documents or PowerPoint presentations were incorporated in the GMA-9 discussion and deliberations (listed in no particular order).

- *Annual Aquifer Recharge From Precipitation, Volume of Water Discharging from Aquifers to Springs and Surface Water Bodies, Including Lakes, Streams, and Rivers, and Volume of Flow Into/Out of GCD Within Aquifers and Between Aquifers GMA-9 Groundwater Conservation Districts*

- *GMA-9 Draft Public Comment Form, 90-Day Public Comment Period, Proposed Desired Future Conditions*

- *Groundwater Management Planning Area 9 (GMA-9) Joint Committee Meeting Monday, September 28, 2015*

- *2012 State Water Plan – Water Management Strategies, GMA-9 GCDs and Counties (By GCD and County) September 28, 2015*

- *2012 State Water Plan – Water Supply Needs, GMA-9 GCDs and Counties (By GCD and County) September 28, 2015*

Ron Fieseler recommended to allow committee members to ask questions throughout the presentations, but save public questions or comments until the Public Comment Agenda Item later in the meeting. Discussion:

Velma gave a summary of joint planning in GMA-9 and the first planning cycle activities, history, DFCs, non-relevant aquifers and the appeal petitions received.

She reiterated that the upcoming DFC will have to satisfy "Balance Test", and luckily, the way GMA-9 conducted its joint planning during the first planning cycle satisfied virtually every aspect of the Balance Test. She reminded everyone about the definition of DFC; it must be a measureable characteristic of the aquifer, but there is no guidance in determining an appropriate metric.

Ron Fieseler asked whether the DFCs set prior to May 2016 will result in MAG quantity in the current Regional Water Plans or will they be incorporated into the next planning period. The answer from Rima Petrossian was the next planning cycle.

There was some discussion about how the Modeled Available Groundwater (MAG) quantity was used by Regional Water Planning Groups (RWPGs). It was pointed out that RWPGs may not propose strategies that exceed MAG.

8. Present and discuss non-relevant aquifer classifications for purposes of joint planning.

The consulting team provided extensive details on the various aquifer portions under consideration by GMA-9 as non-relevant aquifers. There was discussion by committee members on declaring non-relevant aquifers in GMA-9. The consulting team also provided a summary of previous votes on non-relevant declarations. It was clearly noted that any non-relevant declaration by GMA-9 was applicable to joint planning purposes only, and that those aquifer portions declared non-relevant could still be managed by local GCDs. In addition, any such declaration by GMA-9 was non-binding on other GMAs.

9. Present and discuss desired future conditions being considered in current round of joint planning, including policy and technical justifications for each desired future condition.

The consulting team provided extensive details on the process used in the first planning cycle by GMA-9 in the development and approval of the first DFCs. Velma Danielson noted the need to delete the word "draft" from TWDB GAM Task 10-005, as it is no longer a draft and had been finalized. Ron Fieseler mentioned that the current Trinity DFC extends through 2060, and that Region Water Planning Group K will simply extend the numbers for 2060 through to 2070. This will allow GMA-9 to reevaluate the situation during the next planning cycle.
Velma Danielson also noted the need to delete the word "draft" on other documents and presentation, much like TWDB GAM Task 10-005.

For the audience's benefit, and to illustrate how GMA-9 considered the possibility of incorporating drought conditions in the DFC, Ron Fieseler explained that a model run was conducted using average climate conditions for 43 years, then it included the climate conditions present during the 7 drought years in the 1950s. When this was done, however, the drought years skewed the climatic conditions so much that GMA-9 would have had to set the DFC to a number much higher than the current drawdown of approximately 30 feet...to something on the order of 113 feet or even more, just to meet current demand.. Therefore,GMA-9 determined that a more balanced approach would be to have the DFC based on average climatic conditions only. Any drought years should be address by local GCDs who have rule-making and enforcement authority and can best plan for and manage periods of drought.

The consensus of the committee members would be to use the year 2070 for all DFCs except for the Trinity Aquifer.

10. Present and consider nine factors listed in Section 36.108 (d) of Texas Water Code.

The consulting team provided extensive details on the nine factors in 36.108(d).

Ron Fieseler commented that just because there is a regional water management strategy doesn't mean the local GCD has to acknowledge it, approve of it, or plan to meet the strategy. Sometimes there are multiple strategies and that is where the different numbers may come up.

Pertaining to the 3rd factor: Ron Fieseler noted that the "County Other" user group category is prevalent throughout RWPG documents. Need to revise the numbers in the Explanatory Report to reflect this.

Regarding the Total Available Recoverable Storage (TERS), Ron Fieseler noted that it may be possible to get that much water out of any given aquifer, but you may have to drill a well every 10 feet due to the hydrogeological characteristics of that aquifer.

Ron Fieseler stated that maybe Trinity model could be updated during the next planning cycle and noted the importance of selecting appropriate monitor wells that best correlate with the existing Trinity GAM.

George Wissmann asked some questions about the run about the water level decline referred to in handout page 110 of "Historic Pumping Estimates and Average Drawdown in GMA-9". There was some discussion over the pumping curves and the assumptions made for the runs.

BREAK FOR PIZZA LUNCH (Pizza courtesy of the HTGCD and drinks courtesy of the BPGCD). Presentations resumed at 12:54 pm.

Velma Danielson emphasized that their presentation was regarding regulatory compliance and actual GMA-9 processes. Legal questions should be directed to a legal counsel.

Ron Fieseler recommended that the Explanatory Report include environmental flows and socioeconomic considerations wherever possible or supplied by Regional Water Plans.

There was some discussion on the benefits of Hutchinson Report and using it as a way to show where GMA-9 might be able to use it to show compliance with the DFC.

Finally, Velma provided a summary of Factor 9 submissions received from various members of the public via GCDs within GMA-9. After some short discussion, it was decided that each District will review the submissions and this factor, to be revisited on an agenda item next GMA-9 meeting.

11. Discuss and consider classifying portions or all of certain aquifers in GMA-9 as non-relevant for purposes of joint planning.

Micah Voulgaris stated that his Board desires to declare all aquifers located in Kendall County relevant. After some other brief discussions and clarifications, Ron Fieseler referred to slide 15, and the non-relevant aquifer matrix, which he read aloud:

GMA-9 proposes declaring the following aquifers or portions of aquifers as non-relevant for joint planning purposes in all or portions of specified GMA-9 counties or portions of counties:

Edwards Aquifer (Balcones Fault Zone)	**Bexar, Comal, Hays, and Travis Counties**
Edwards-Trinity (Plateau)	**Blanco and Kerr Counties**
Ellenburger-San Saba	**Blanco and Kerr Counties**
Hickory	**Blanco, Hays, Kerr, and Travis Counties**
Marble Falls	**Blanco County**

Following this reading, a motion was made by David Caldwell and seconded by George Wissmann to declare the aquifer portions as read, to be non-relevant aquifers for GMA-9 joint planning purposes. The motion passed unanimously 9-0.

The GMA-9 Committee noted that these will be considered as proposed non-relevant aquifers, and will be included with the proposed DFCs at local GCD DFC Public Hearings.

12. Discuss and consider adopting proposed desired future conditions (per Section 36.108 (d) of Texas Water Code).

Ron Fieseler read the DFC as stated on page 47 of the consulting team report, deleting the word "Draft". Ron asked Rick Broun if he wished to make a comment. Rick Broun stated that his District held a

workshop on this subject the previous week. His Board voted 2 ayes and 2 nays (there were four Directors present), so he was going to have to abstain.

Trinity Aquifer

Allow For An Increase in Average Drawdown of Approximately 30 Feet Through 2060 (throughout GMA-9) Consistent with "Scenario 6" in TWDB GAM Task 10-005.

Motion made by Micah Voulgaris and seconded by David Caldwell to adopt the proposed DFC for the Trinity Aquifer as read. The vote was 8 ayes - 0 nays - 1 abstention and the motion passed.

Edwards-Trinity (Plateau) Aquifer

Allow For No Net Increase in Average Drawdown in Bandera and Kendall Counties through 2070.

Motion by Micah Voulgaris and seconded by Michael Redman to approve the DFC as read. Motion passed unanimously 9-0.

Ellenburger-San Saba Aquifer

Allow For An Increase in Average Drawdown of No More Than 2 Feet in Kendall County through 2070.

Motion by Micah Voulgaris and seconded by George Wissman to approve the DFC as read. Motion passed unanimously 9-0.

Hickory Aquifer

Allow For An Increase in Average Drawdown of No More Than 7 Feet in Kendall County through 2070.

Motion by Micah Voulgaris and seconded by George Wissman to approve the DFC as read. Motion passed unanimously 9-0.

13. Discuss and consider public comment process for desired future condition public hearings.

Ron Fieseler stated that he will send a letter on the Proposed DFCs and non-relevant aquifer declarations to all GCDs in GMA-9. The mailing date is expected to be September 30, 2015 and will start the Public Comment period (October 1, 2015 to December 31, 2015). Each District will need to schedule a Public Hearing. Each District should have a copy of the revised September 28, 2016 PowerPoint Presentation and 3 tables for review by the public. Each GCD must take public comment at a public hearing and compile a report on relevant public comments to be submitted to GMA-9. A revised Public Comment Form will be made available to all GCDs. There was some discussion on Districts posting the Public Hearing, and the recommendation was made that each District should check their rules pertaining to notification of public comment. Ron Fieseler said he would include this on agenda for the next meeting.

14. Reports on regional water planning activities by GMA-9 representatives to Regions J, K, and L.

Region J - Has completed the final stages of initially prepared plan.

Region K - has held its three public hearings on the submitted IPP. They will be ready to conduct prioritizations and possible adoption, perhaps at the next meeting on October 14, 2015 or one of two possible meetings in November.
Region L - approved initially prepared plan; public hearing process has begun (ongoing)

15. Public Comment.

1. Larry Hoffman- (Spicewood, TX)
    - Has a private well in Trinity Aquifer
        - He acknowledged the detail of the report
        - Stated that he is a fundamentalist
            - Recharge = discharge should be foremost in our thinking
            - Idea of a sustainable supply has to be 1st consideration
                - Then can think of growth (with existing supplies)
        - He is concerned that a DFC is meaningless because it does not tell you how much water you can get or how it manages uncontrolled growth
            - Referenced a meeting in 2010
                - What happens if a GCD reaches the DFC was asked to TWDB? (May have to stop pumping was the answer given.)
        - Monitor wells
            - Where are they, how are they located?
            - We need a good system for that
        - Consequences of not considering the drought of record
        - How do we do anything about all of this?
            - We need to control growth in some way
                - How can we issue permits for building or for additional water when we are going to run out?
        - Examples of problems:
            - San Antonio trying to get 50, 000 ac-ft of water from outside county.
            - Hays County is trying to get water from outside of their county.
                - Posed the question—How do we repay those users for their loss?

2. Rene Ruiz (attorney for Flying L Guest Ranch in Bandera County)
        - Asked how the Flying L Guest Ranch should submit the Hardin and Associates report to GMA-9?
            - Ron Fieseler replied that he recommended they attend BCRAGD's Public Hearing and provide public comment and attach the report. Further discussion with other committee members made it clear that local GCDs are the main contact and that they will turn in all relevant comments to GMA-9.
3. Michael Maurer
    - Clarification on proposal of 30 foot draw down is it the same as last time or does it add to the last one? David Caldwell responded that it is the same as last time.
    - Michael Maurer also made some general statements on the mining of the aquifers and how GCD are not protecting the aquifers.

4. Don Casey (Board member from Blanco Pedernales GCD)
        - When was last computer run and what is the drawdown now?
            - Ron Fieseler, Brian Hunt, and David Caldwell worked together to explain that the TWDB's last GAM run was sometime in 2009 or 2010. Bill Hutchison performed his own runs for the report GMA-9 hired him to do.

- It was also pointed out that GMA-9 does not currently know exactly because we have been in almost continual drought ever since the original DFC was adopted, but we are still collecting data and really need a few years of more normal climate conditions.

5. Linda Kay Rogers (Director of Hays Trinity GCD)
    - Has had the same questions as Don Casey
    - She feels 5 years has not really been enough time to collect that data; Hopefully 10 years will be enough data

16. Next meeting date, location, and future agenda items.

Following a short discussion, the Committee members selected 10:00 am on October 13, 2015 at the Bandera County River Authority and Groundwater District's office in Bandera, TX.

Factor 9 issues and the Public Comment form and procedures will be on next meeting agenda.

17. Announcements.

None.

18. Adjournment. 3:18 p.m.

Motion made by David Caldwell and seconded by George Wissmann to adjourn meeting at 3:18 p.m. The motion passed unanimously.

Approved by GMA-9 Consensus _____, 2015.

Attest: _____
Ronald G. Fieseler, Chairman

Attest: _____
Morgen Ayers, Secretary

Groundwater Management Area 9 Joint Planning Committee Meeting

NOTICE OF OPEN MEETING

As required by Section 36.108(e), Texas Water Code, a meeting of the **Groundwater Management Area 9 Joint Planning Committee**, comprised of district representatives from the following groundwater conservation districts located wholly or partially within Groundwater Management Area 9: Bandera County River Authority and Groundwater District, Barton Springs/Edwards Aquifer Conservation District, Blanco-Pedernales Groundwater Conservation District, Comal Trinity Groundwater Conservation District , Cow Creek Groundwater Conservation District, Comal Trinity Groundwater Conservation District , Edwards Aquifer Authority, Headwaters Groundwater Conservation District, Hays-Trinity Groundwater Conservation District, Trinity-Glen Rose Groundwater Conservation District, and Medina County Groundwater Conservation District, will be held on **Tuesday, October 13, 2015, at 10:00 am at the Bandera County River Authority and Groundwater District, 440 FM 3240, Bandera, TX 78003 (830)796-7260.**

Discussion and/or possible action may occur on the following business matters:

1. Call to Order.
2. Receipt of Posted Meeting Notices.
3. Introductions.
4. Approval of April 27, 2015, June 8, 2015, and September 28, 2015 GMA 9 Meeting Minutes.
5. Texas Water Development Board updates, comments, or communications.
6. Discuss and consider issues submitted by GMA 9 GCDs on the 9th Factor (Section 36.108 (d)) –"Any Other Information Relevant to Specific DFCs".
7. Consider re-validating all discussion, actions, and votes by GMA 9 at the September 28, 2015 GMA 9 Meeting and including any additional discussion, action, or vote taken on Factor 9 as a result of Item #7 on today's agenda.
8. Review and consider the revised Public Comment Form and the public comment process for desired future condition public hearings.
9. Presentation by Brian Hunt, PG, regarding DFC monitoring considerations.
10. Public Comment.
11. Next meeting date, location, and future agenda items.
12. Announcements.
13. Adjournment.

Further information, questions, or comments concerning any aspect of this meeting should be directed to:
Mr. Ron Fieseler, GMA 9 Planning Committee Chairman
c/o Blanco-Pedernales Groundwater Conservation District
601 West Main, P.O. Box 1516, Johnson City, TX 78636
(830) 868-9196 office, (830) 708-5020 cell, email to: manager@blancogw.org

Came to hand and posted on the bulletin board, and/or the _____, at the _____ County Courthouse, on this, the _____ day of _____, 2015 at _____ ( ) a.m. / ( ) p.m. by:

Printed Name _____

Signed, _____, _____ County, TEXAS

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FILED this 1st day of Oct. 2015
LAURA WALLA 9:52 AM
County Clerk Blanco County, Texas
By Shelli Kinsley Deputy

Groundwater Management Area 9 Joint Planning Committee Meeting

Minutes
Monday, October 13, 2015—10:00 a.m.
Bandera County River Authority and Groundwater District
440 FM 3240 Bandera, Texas

1. Call to Order.

Ron Fieseler, GMA-9 Chairman, called the meeting to order at 10:05 a.m. He acknowledged that all GMA-9 Committee members were present except the Comal Trinity District and the Edwards Aquifer Authority.

2. Receipt of Posted Meeting Notices.

All GCDs posted the Meeting Agenda.

3. Introductions.

The attending Board Presidents or Designated Representatives introduced themselves:

Barton Springs/Edwards Aquifer Conservation District- Brian Hunt, P.G. and DR
Medina County Groundwater Conservation District- David Caldwell, General Manager and DR
Trinity-Glen Rose Groundwater Conservation District- George Wissmann, General Manager and DR
Blanco-Pedernales Groundwater Conservation District- Ron Fieseler, P.G. General Manager and DR
Cow Creek Groundwater Conservation District- Micah Voulgaris, General Manager and DR
Bandera County River Authority and Groundwater District- Michael Redman, DR
Headwaters Groundwater Conservation District- Gene Williams, General Manager and DR
Hays Trinity Groundwater Conservation District- Rick Broun, General Manager and DR

Absent- Comal Groundwater Conservation District-Larry Hull, Board President
Edwards Aquifer Authority- Julia Carrillo, DR.

4. Approval of April 27, 2015, June 8, 2015, and September 28, 2015 GMA 9 Meeting Minutes.

Ron Fieseler stated a spelling correction that needs to be made on previous minutes:
"Morgan" to "Morgen"

Velma Danielson stated a correction to the September 28, 2015 minutes:
Page 4, item 13; where it says "Each district should have a copy of the Explanatory Report...", it is recommended to change to "Each District should have a copy of the revised September 28, 2016 PowerPoint presentation and three tables…"

The Minutes were adopted by consensus.

Ron Fieseler then skipped ahead on the agenda to item 12 to allow for an announcement:

Marcus Gary, PG announced that:

- EAA is working with TWDB, getting as many water levels (Trinity and Edwards) as they can to feed into TWDB database for a synoptic study.
- Announced the South-Central Texas Water Research Interest Group (SCTWRIG) meeting on December 3, 2015 at Bandera County River Authority and Groundwater District office; there may be a field trip component.

5. Texas Water Development Board updates, comments, or communications.

Rima Petrossian stated that TWDB met yesterday with modelers and went over proposed DFCs, from the stand point of modeling. TWDB wanted to make GMA 9 aware that TWDB will need the following information to move forward:

- GMA 9 needs to consider if they want to extend the DFC to 2070 since the current DFC is only specified through 2060. TWDB would most likely use same results and same assumptions for the additional decade.
- The Edwards-Trinity Plateau model will be used instead of the Hill Country Trinity model
    - GMA 9 needs to accept TWDB base year recharge assumptions for the Trinity, Ellenburger and Hickory or be prepared to provide the TWDB with new assumptions.

Discussion:

Ron Fieseler stated that there are two options:

a. Change DFC timeline now
b. Let proposed DFCs (which leave Ellenburger and Hickory alone) go out for public comment and task the liaison team with looking at the effects—then when we go to final adoption, we can take those comments and change things if necessary

Rima Petrossian wanted to be clear that if you take what TWDB is proposing, it doesn't factor in the drought of record.

Ron Fieseler stated that GMA 9 will include this in the Liaison Committee's tasks.

Rima Petrossian commented that exempt-use estimates are still making their way through the system Gene Williams asked if those will be broken down through Trinity and Edwards aquifers, to which Rima Petrossian replied, yes.

6. Discuss and consider issues submitted by GMA 9 GCDs on the 9th Factor (Section 36.108 (d)) –"Any Other Information Relevant to Specific DFCs".

- Brian Hunt comments:
  - commented regarding the pumping in GMA 10/GMA 9 line discussion; there will be a more localized (approximately a 5 mile radius) assessment of what pumping will do over the next couple of years (funded by BSEACD)
    - Ron Fieseler does not think this immediately affects the DFC, but GMA 9 needs to look at long term implications on other GCDs
      - George Wissmann mentioned that his GCD would be interested also
      - Brian Hunt suggested using existing well data for purposes of addressing factor 9 of GMA 10 which could also be used in GMA 9
      - GMA 9 can include a statement detailing whether this factor does or does not affect GMA 9 in the Explanatory Report
- Hays Trinity comments:
  - A. Enabling legislation does not allow exempt wells to be permitted; DFC burden is carried by non-exempt wells
  - B. Limited funding—does not allow some participation in studies

Micah leaves at 10:41

  - C. Western Travis county- no GCD
  - D. Unprecedented growth in Hays County (Ron Fieseler added Comal County)
  - E. Differences in local hydrogeology - suggests chance to fragment DFC
    - Ron Fieseler commented that the model is built with multiple hydrogeological assumptions already, but that GMA 9 might revisit this during next planning cycle
  - F. Education and Public Outreach
    - Especially on terminology
    - Maybe TWDB could make efforts on that also
      - Velma: part of the ER will cover this process
      - Ron suggested that GMA 9 reference TWDB's educational resources
  - G. We don't have enough data to answer where we are on drawdown but it was noted that this is not part of the 9th factor

Velma summarized what had been covered up to this point.

Three comments were noted that GMA 9 agreed should go into the 9th factor discussion

- Headwaters CGD comments
  - In reply to the question asked about how ASR projects affects the DFC
    - ASR makes it unique
    - Injections will show increase in MAG
    - Over time can affect the 30 ft DFC
    - Velma asked for a copy of the graph in Gene's comments

- Dave Mauk asked Rima if TWDB is considering taking ASR into consideration with modeling?
  - Ron stated that we could ask modelers when they meet
  - George Wissmann stated that they have an issue but are working with TWDB to obtain high volume exempt well usage estimates before they can permit non-exempt wells
  - Ron Fieseler stated that it sounds like the high-volume exempt wells in the Trinity Glen Rose GCD need to be listed as a 9th factor

7. Consider re-validating all discussion, actions, and votes by GMA 9 at the September 28, 2015 GMA 9 Meeting and including any additional discussion, action, or vote taken on Factor 9 as a result of Item #7 on today's agenda.

Motion made by Brian Hunt, seconded by David Caldwell to re-validate discussions, actions, and votes by GMA 9 at the September 28, 2015 meeting and include additional discussion, actions, and votes at the meeting today . The vote was 7 ayes, 0 nays, and 0 abstentions and the motion passed.

8. Review and consider the revised Public Comment Form and the public comment process for desired future condition public hearings.

Ron Fieseler discussed the form, how it should go on each District's agenda that it should be posted in newspaper. Districts were encouraged to make available copies of proposed DFCs at each GCD office. Velma noted that this will also apply for final DFC process.

Velma stated that Blanton & Associates are looking at two April meetings to allow GMA 9 to complete the DFC adoption process.

By consensus there are no objections to using the comment form.

9. Presentation by Brian Hunt, PG, regarding DFC monitoring considerations.

Brian Hunt, PG gave a presentation titled, "An Approach to Monitoring Compliance with the Desired Future Condition of the Texas Hill Country Trinity Aquifer" He asked for contribution of data from other GMA 9 Districts.

10. Public Comment.

Ernie DeWinne (Board Member of the BCRAGD)

- ASR- he attended a TRWA legislative meeting; State Rep. Lucio was very interested in the proposed BCRAGD small scale rainwater ASR pilot project.
- Legal - he asked for other GCD support in BCRAGD's litigation with Flying L Guest Ranch

11. Next meeting date, location, and future agenda items.

Meeting dates will be selected after the completion of Public Hearings.

12. Announcements.

Charlie Flatten noted that a symposium on the SAWS Vista Ridge Project was scheduled for 7pm Wednesday, October 21, at the UTSA Main Campus in San Antonio.

13. Adjournment. 12:00

Adjournment at 12:05 pm was approved by GMA-9 Consensus

Approved by GMA-9 Consensus _____, 2016.

Attest: _____
Ronald G. Fieseler, Chairman

Attest: _____
Morgen Ayers, Secretary

Groundwater Management Area 9 Joint Planning Committee Meeting

NOTICE OF OPEN MEETING

As required by Section 36.108(e), Texas Water Code, a meeting of the **Groundwater Management Area 9 Joint Planning Committee**, comprised of district representatives from the following groundwater conservation districts located wholly or partially within Groundwater Management Area 9: Bandera County River Authority and Groundwater District, Barton Springs/Edwards Aquifer Conservation District, Blanco-Pedernales Groundwater Conservation District, Comal Trinity Groundwater Conservation District , Cow Creek Groundwater Conservation District, Edwards Aquifer Authority, Headwaters Groundwater Conservation District, Hays-Trinity Groundwater Conservation District, Trinity-Glen Rose Groundwater Conservation District, and Medina County Groundwater Conservation District, will be held on **Monday, April 18, 2016, at 10:00 am at the Dripping Springs City Hall, 511 Mercer Street, Dripping Springs, Texas.**

Discussion and/or possible action may occur on the following business matters:

Filed this 6th day of April 2016
Laura Walla 3:49 PM
LAURA WALLA
County Clerk Blanco County, Texas

1. Call to Order.
2. Receipt of Posted Meeting Notices.
3. Introductions.
4. Approval of October 13, 2015 and April 4, 2016 GMA 9 Meeting Minutes.
5. Texas Water Development Board updates, comments, or communications.
6. Review Draft *"Groundwater Management Area 9 Explanatory Report for Desired Future Conditions for Major and Minor Aquifers."*
7. Consider approval of the GMA 9 draft document "Summarization of Public Comments Received and GMA 9 Responses" which will be attached to the Explanatory Report as "Appendix B".
8. Consider approval of GMA 9 Resolution # 041816-1 "Adopting the Groundwater Management Area 9 Joint Planning Committee's (GMA 9) Classifications of Non-Relevant Aquifers for Joint Planning Purposes and Desired Future Conditions for Relevant Aquifers in GMA 9", and authorizing the GMA 9 Chairman to formally submit them and all other required information to the TWDB."
9. Consider approval of *"Groundwater Management Area 9 Explanatory Report for Desired Future Conditions for Major and Minor Aquifers."*
10. Public Comment.
11. Next meeting date, location, and future agenda items.
12. Announcements.
13. Adjournment.

Further information, questions, or comments concerning any aspect of this meeting should be directed to:
Mr. Ron Fieseler, GMA 9 Planning Committee Chairman
c/o Blanco-Pedernales Groundwater Conservation District
601 West Main, P.O. Box 1516, Johnson City, TX 78636
(830) 868-9196 office, (830) 708-5020 cell, email to: manager@blancogw.org

Came to hand and posted on the bulletin board, and/or the _____, at the _____ County Courthouse, on this, the _____ day of _____, 2016 at _____ ( ) a.m. / ( ) p.m. by:

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Signed, _____, _____ County, TEXAS

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STATE OF TEXAS §
§ **RESOLUTION # 041816-01**
GROUNDWATER §
MANAGEMENT AREA-9 §

Adopting the Groundwater Management Area 9 Joint Planning Committee's (GMA-9) Classifications of Non-Relevant Aquifers for Joint Planning Purposes and Desired Future Conditions for Relevant Aquifers in GMA-9

WHEREAS, the Groundwater Conservation Districts (GCDs) located within or partially within Groundwater Management Area 9 (GMA-9) are required under Chapter 36.l08, Texas Water Code to conduct joint planning and designate the Desired Future Conditions (DFCs) for aquifers within GMA-9 and;

WHEREAS, the Board Presidents or their Designated Representatives of the GCD Members of the Groundwater Management Area 9 Joint Planning Committee (GMA-9) have met as a Committee in various meetings and conducted joint planning in accordance with Section 36.l08, Texas Water Code since September 2005 and;

WHEREAS, GMA-9, having given proper and timely notice, held an open meeting of the GMA-9 Committee on April 18, 2016 at the Dripping Springs City Hall, 511 Mercer Street, Dripping Springs, Texas and;

WHEREAS, following GMA-9's September 28, 2015 adoption of GMA 9 Proposed DFCs and the Proposed Classification of Non Relevant Aquifers, and in accordance with Section 36.108, GMA-9 has solicited and considered public comment during a Public Hearing at each GCD located within or partially within GMA-9, through written public comments, and through public comment in person at various GMA-9 Committee meetings, and;

WHEREAS, the GMA-9 Committee received and considered technical advice regarding local aquifers, hydrology, geology, recharge characteristics, local groundwater demands and usage, population projections, ground and surface water inter-relationships, and other considerations that affect groundwater conditions from the Texas Water Development Board (TWDB), Regional Water Planning Groups J, K, and L, consultants, hydrologists, geologists, and other groundwater professionals, and;

WHEREAS, following public discussion and due consideration of the current and future needs and conditions of the aquifers in question, the current and projected groundwater demand estimates from local GCDs, the TWDB, and Regional Water Planning Groups J, K, and L, and the potential effects on springs, surface water, habitat, and water-dependent species for DFCs set through the year 2060 or the year 2070, as applicable, the following motions were made and acted upon:

Motion #1:

Moved by Micah Voulgaris and seconded by George Wissmann to adopt the following Desired Future Condition through the year 2060 for the Trinity Aquifer located in GMA 9:

- Allow for An Increase in Average Drawdown of Approximately 30 Feet Through 2060 (Throughout GMA-9) Consistent With "Scenario 6" in TWDB GAM Task 10-005.

The vote on the motion was 9 ayes, 0 nays, and 0 abstentions, and the Motion Passed.

Motion #2

Moved by Dave Mauk and seconded by Micah Voulgaris to adopt the following Desired Future Condition through the year 2070 for the Edwards Group of the Edwards-Trinity (Plateau) Aquifer for those portions located in Kendall and Bandera counties:

- Allow For No Net Increase in Average Drawdown in Kendall and Bandera Counties Through 2070.

The vote on the motion was 9 ayes, 0 nays, and 0 abstentions, and the Motion Passed.

Motion #3

Moved by Micah Voulgaris and seconded by David Caldwell to adopt the following Desired Future Condition through the year 2070 for the portions of the Ellenburger-San Saba Aquifer located in Kendall County:

- Allow for An Increase in Average Drawdown of No More Than 2 Feet in Kendall County Through 2070.

The vote on the motion was 9 ayes, 0 nays, and 0 abstentions, and the Motion Passed.

Motion #4

Moved by Micah Voulgaris and seconded by George Wissmann to adopt the following Desired Future Condition through the year 2070 for the portions of the Hickory Aquifer located in Kendall County:

- Allow for An Increase in Average Drawdown of No More Than 7 Feet in Kendall County Through 2070.

The vote on the motion was 9 ayes, 0 nays, and 0 abstentions, and the Motion Passed.

Motion #5

Moved by Gene Williams and seconded by Larry Hull to propose the Edwards Group of the Edwards-Trinity (Plateau) Aquifer located in Blanco County and Kerr County be classified as a non-relevant aquifer for the purposes of joint planning.

The vote on the motion was 9 ayes, 0 nays, and 0 abstentions, and the Motion Passed.

Motion #6

Moved by Ronald G. Fieseler and seconded by Larry Hull to propose the Ellenburger-San Saba Aquifer located in Blanco County and Kerr County be classified as a non-relevant aquifer for the purposes of joint planning.

The vote on the motion was 9 ayes, 0 nays, and 0 abstentions, and the Motion Passed.

Motion #7

Moved by George Wissmann and seconded by David Caldwell to propose the Hickory Aquifer located in Blanco, Hays, Kerr, and Travis counties be classified as a non-relevant aquifer for the purposes of joint planning.

The vote on the motion was 9 ayes, 0 nays, and 0 abstentions, and the Motion Passed.

Motion #8

Moved by Ronald G. Fieseler and seconded by Rick Broun to propose the Marble Falls Aquifer located in Blanco County be classified as a non-relevant aquifer for the purposes of joint planning.

The vote on the motion was 9 ayes, 0 nays, and 0 abstentions, and the Motion Passed.

Motion #9

Moved by Larry Hull and seconded by Brian Hunt to propose the Edwards Aquifer (Balcones Fault Zone) located in Bexar, Comal, Hays, and Travis counties be classified as a non-relevant aquifer for the purposes of joint planning.

The vote on the motion was 9 ayes, 0 nays, and 0 abstentions, and the Motion Passed.

Whereas, the above Motions and Votes of each Committee Member have been recorded in the Minutes of the April 18, 2016 GMA-9 Committee Meeting,

NOW THEREFORE BE IT RESOLVED, Groundwater Management Area 9 Joint Planning Committee Members present and voting on April 18, 2016 do hereby document, record, and confirm the above described Motions and Votes.

Approved by consensus and signed on April 18, 2016 by the following Voting Groundwater Management Area 9 Joint Planning Committee Members:

Ronald G. Fieseler - General Manager and Designated Representative for the Blanco Pedernales GCD

Dave Mauk – General Manager and Designated Representative for the Bandera County River Authority and Groundwater Conservation District

David Caldwell - General Manager and Designated Representative for the Medina County GCD

Rick Broun - General Manager and Designated Representative for the Hays Trinity GCD

Brian Hunt - Designated Representative for the Barton Springs/Edwards Aquifer Conservation District

Micah Voulgaris – General Manager and Designated Representative for the Cow Creek GCD

George Wissmann – General Manager and Designated Representative for the Trinity Glen Rose GCD

Gene Williams - General Manager and Designated Representative for the Headwaters GCD

Larry Hull - President of the Comal Trinity GCD

Appendix B

Summarization of Public Comments Received and GMA-9 Responses
April 2016

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Appendix B

Summarization of Public Comments Received and Groundwater Management Area 9 Responses April 18, 2016

All the Public Comments (both written and oral) received by Groundwater Management Area 9 (GMA-9), its member Groundwater Conservation Districts (GCDs), and the GMA-9 Chairman have been consolidated into similar comment groupings whenever possible within this document in order to allow for a more efficient review and GMA-9 Response of the public comments. Members of the GMA-9 Explanatory Report Liaison Subcommittee met on two separate occasions in March 2016 to discuss, review and respond to the public Comments prior to presenting them to the full GMA-9 Committee for review and consideration.

No Comments

There were four GCDs that had received no public comments of any kind during the Public Hearings held at those GCDs. These were the Blanco-Pedernales GCD, Headwaters GCD, and the Edwards Aquifer Authority, and the Medina County Groundwater Conservation District.

No Comments, but Questions Asked

The Cow Creek GCD and the Bandera County River Authority and Groundwater District (BCRAGD) received no public comments, but each district had one question asked at the Public Hearing which was answered or clarified by the district staff or their Board. A Kendall County Commissioner asked the Cow Creek GCD why there was a 50 year time line for GMA planning. *GMA-9 Response: GMAs use a 50 year planning horizon in an effort to coordinate with the Regional Water Planning Groups.* The BCRAGD was asked why the Proposed Desired Future Condition (DFC) would be an adequate restriction if the model resulted in less water was being available in future decades. *GMA-9 Response: GMAs set the DFC and then the Modeled Available Groundwater (MAG) is calculated by the Texas Water Development Board (TWDB). The MAG is calculated on a TWDB approved Groundwater Availability Model (GAM). BCRAGD General Manager Dave Mauk pointed out to the Commissioner that the DFC/GAM is not a restriction, but rather a managed drawdown scenario, and is intended to balance the groundwater demands of many users and interest groups.*

Comments Against the Proposed DFCs

Two public comments were received by members of the public who simply stated that they did not like the Proposed DFC for the Trinity Aquifer, but offered no facts, details, or suggested alternatives. *GMA-9 Response: GMA-9 is aware that there are those who disagree with the Proposed DFC. Despite scattered opposition, current data and future projections indicate that the Proposed DFC is reasonable and appropriate for the aquifer and aquifer users at this time.*

Comments Recommending a DFC based on Spring Flow

Public comments were submitted that suggested the DFC should be based on spring flow. Those commenting wanted to protect, maintain, and restore spring flow by limiting pumping from the aquifer and reducing population growth over the aquifer. These comments were essentially conceptual in nature and offered no specific DFC language alternatives. *GMA-9 Response: GMA-9 had numerous requests to base the DFC on spring flow during the first GMA planning cycle (2005-2010). In GMA-9 Response to this public input, GMA-9 asked the TWDB to conduct some GAM runs in order for the GMA-9 Committee to evaluate the feasibility of using spring flow in establishing the DFC. The modeling indicated that spring flow could not be maintained during drought years, even with ZERO pumping. The GMA-9 Committee determined that any DFC based on maintaining or restoring spring flow could not be achieved through any designated DFC. Additionally, GMA-9 determined that protection of spring flow was best left to local GCDs who could promulgate rules and management plans to address local spring-related issues.*

Comments Recommending "Zero Drawdown"

Several public comments focused on the concept of designating a DFC based on "Zero Drawdown" or, as it is sometimes phrased, "Sustainability". This concept is based on managing an aquifer wherein recharge equals discharge, with an ultimate goal of maintaining a balance in the groundwater system. These comments were quite similar in intent and purpose, and despite differences in phrasing, all comments essentially recommended changing the DFC to "no change in average drawdown" or "no increase in pumping". GMA-9 Response: During the first planning *cycle, the GMA-9 Committee designated a "Zero Drawdown" DFC for the Edwards Group of the Edwards-Trinity (Plateau) aquifer within the GMA-9. This DFC was appealed by two different public interests filing timely petitions with the TWDB. The appeal process proceeded to a Public Hearing before the TWDB Directors in Austin. Following testimony at that Public Hearing, by both the appellants and GMA-9, the TWDB found the DFC to be "not-reasonable" because it did not address projected future exempt use. It was clear from the findings of the TWDB Public Hearing that a "Zero Drawdown" DFC would not be considered achievable or reasonable. Therefore, GMA-9 could not adopt any such recommended DFC.*

Comments Recommending a Reduction in the DFC

Additional public comments were received which suggested that GMA-9 should change the current DFC to a decreased amount of drawdown. No suggested drawdown numbers were provided by any member of the public, just a general desire for a decreased number in hopes of protecting creek and spring flow and reducing the number wells going dry. *GMA-9 Response: GMA-9 considered many DFC scenarios and tested them with numerous model runs. GMA-9 chose the current DFC as the "best fit" to provide for current demands, reasonable accommodations for projected future demands, and to impact creek and spring flow as little as possible. Based on the model runs and best available data, GMA-9 believed that a DFC based on a decreased drawdown may be unachievable and not reasonable because it will likely not provide sufficient water for current and projected demands.*

Comments Recommending Incorporating the Drought of Record in the DFC

One public comment was received that specifically suggested that GMA-9 include the drought of record in the DFC and a few other comments touched on the same concept. *GMA-9 Response: GMA-9 tried numerous model run scenarios using a specific DFC which included the drought of record. The model results proved unworkable because the drought of record skewed the results significantly and would require setting a DFC with a dramatically increased drawdown just to meet current demand during an unpredictable period of time. A different approach toward including drought conditions was incorporated in TWDB GAM Run 10-005 (by Hutchison). This GAM run used tree ring analysis to approximate climatic conditions and used 2008 estimated pumping conditions as a baseline for calculating drawdown changes. Hutchinson included over 2,700 model runs with varying climatic conditions including many in which drought years were incorporated in the simulations. This yielded more usable results and GMA-9 chose to use "Scenario 6" in establishing the DFC as it seemed to be the best compromise between pumping needs and conservation needs. GMA-9 has also determined that drought management is best addressed through local GCD rules and management plans.*

Comments Regarding the TWDB Model

Several public comments were received that complained about the Hill Country Trinity Groundwater Availability Model being inadequate and/or out-of-date. Some comments made the point that the model was based on regional assumptions and could not be used for local or real-time projections of stream flow, spring flow, and groundwater levels. *GMA-9 Response: The Hill Country Trinity Groundwater Availability Model was created and is maintained by the TWDB. Member GCDs of GMA-9 worked with the TWDB during the first planning cycle (2005-2010) in a partial revision of the model when local studies proved that recharge assumptions for the Cibolo Creek watershed were grossly incorrect. No revisions have been made to the model during the present planning cycle, but GMA-9 has talked with the TWDB about the possibility of GMA-9 working with the TWDB on a model update in the future. It is important to remember that the Hill Country Trinity Groundwater Availability Model was designed and created as a regional model...it was never intended to be used as a tool for localized predictive modeling.*

Comments Suggesting that all Aquifers be Declared Relevant

Other public comments suggested that all aquifers should be considered relevant for planning purposes. *GMA-9 Response: GMA-9 agrees that all aquifers should be consider relevant for planning purposes. However, GMA-9 has also determined that some aquifers are relevant for regional planning purposes while others are relevant for local planning purposes only and may not need to be addressed on a regional level. GMA-9 reviews these issues each planning cycle and may make changes when appropriate.*

Unique Individual Public Comments

Kirk Holland, P.G. suggested the following:

- GMA-9 should declare the Upper Trinity "Non-Relevant" throughout GMA-9 or allow local GCD option to retain it as "Relevant". *GMA-9 Response: This is the current policy of GMA-9.*
- GMA-9 could then redefine the DFC to include only the Middle and Lower Trinity aquifers. *GMA-9 Response: GMA-9 has chosen to include the entire Trinity aquifer in the DFC. In this way, we have obtained calculated MAG quantities for all Trinity aquifer layers which are useful in our regional planning.*
- Since GMA-9 is basing its DFC on average climatic conditions and Regional Water Planning Groups base their planning on drought of record climatic conditions, GMA-9 should provide, as an addition to the MAG, a "fact-based, best-estimate" of how much less groundwater would be available during a drought of record so that the lower quantity could be factored into Regional Water Planning. A second component of this effort would be for GMA-9 and its member GCDs to determine what quantity of their local drought management strategies might apply to reduce that difference and where shortfalls, if any, could be identified for Regional Water Planning Group attention. *GMA-9 Response: Regional Water Planning Groups are required to include the MAG quantities provided by the TWDB in the Regional Water Plans. As previously noted, GMA-9 has chosen to use average climatic conditions in the DFC after model runs with a DFC which included the drought of record proved unworkable. GMA-9 has determined that drought management is best addressed through local GCD rules and management plans. Regional Water Planning Groups include both Conservation and Drought Management in their water management strategies and this may very well address the issues raised.*

Wimberley Valley Watershed Association

- This organization made a specific suggestion that GMA-9 set a DFC that would maintain an average flow of 4-7 cfs from Jacob's Well near Wimberley during average conditions and a minimum flow of 2cfs during all conditions, including the drought of record. *GMA-9 Response: As previously noted, TWDB model runs indicate that the proposed DFC of 2 cfs minimum flow during a drought cannot be achieved even with zero pumping from the aquifer. It is highly unlikely that the 4-7 cfs flow rate during average conditions could be achieved either, because any such DFC would have to include such drastic reductions in groundwater pumpage that it would require a corresponding reduction in population throughout GMA-9. Based on numerous modeling run results, GMA-9 does not view either of the two proposed DFCs to be reasonable or achievable.*

Flying L Guest Ranch (FLGR)

- FLGR provided extensive comments and a report titled "Hydrogeologic Evaluation of the Flying "L" Guest Ranch, Bandera County, Texas" prepared by R.W. Harden & Assoc., authored by James E. Bene, P.G.
- FLGR recommended that the above referenced report be incorporated into the Hill Country Trinity GAM due to the unique hydrogeological characteristics of their property. *GMA-9 Response: Any requests that specific reports, data, or hydrogeological conditions be included in the GAM must be directed to the TWDB, not GMA-9. However, in order that potentially useful hydrogeological information not be overlooked, GMA-9 recommends that this report and all supporting data undergo a peer review process by the TWDB and by Professional Geoscientists employed by, or contracting with, GMA-9 member GCDs for possible applicability in either the GAM or in the next planning cycle.*
- FLGR recommends that the DFC drawdown be increased in order to generate a larger MAG quantity. This suggestion was based in part on the "total estimated recoverable storage" (TERS) quantities calculated for Bandera County by the TWDB. *GMA-9 Response: GMA-9 has reviewed dozens of model runs during the past 10 years. These model runs covered a broad spectrum of potential DFC drawdown scenarios and spring flow scenarios. GMA-9 chose the current DFC (and the currently proposed renewal of that DFC) as the scenario that would be most likely to provide a balance between the highest practicable level of groundwater production and the conservation, preservation, protection, recharging, and prevention of waste of groundwater and control of subsidence in the management area.GMA-9 also considered the TERS report in determining the current DFC.*

GMA-9 appreciates all public comments and public participation our GMA-9 meetings and Public Hearings. GMA-9 will retain all public comments and will re-consider relevant comments during the next planning cycle.

None of the GMA-9 member GCD Boards of Directors proposed any changes to the GMA-9 Proposed DFCs as a result of the public comments received at their Public Hearings, or through the public comment period.

Considered and adopted by GMA-9 on April 18, 2016.

_____

Ronald G. Fieseler, P.G.
Chairman, GMA-9

_____

Morgen Ayers
Secretary, GMA-9